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TABLES

FOR THE COMPUTATION

OF

Railway and Other Earthwork

COMPUTED BY

C. L. CRANDALL, C. E.,

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FIFTH EDITION

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Preface to the First Edition.

THE object of these tables is to present a convenient aid in the Computation of Railway Earthwork. The volume is first found by the approximate method of averaging end areas, to which can be added, if desired, a correction due to the strict prismoidal formula, or a correction due to a modification of it for irregular ground. This separation reduces the labor, if both parts are computed at once, while it allows of computing only the approximate value at first, which will answer for all purposes except the final estimate, leaving the prismoidal correction to be computed at leisure on those volumes only where it is large enough to be appreciable.

The Table for "Volume by Averaging End Areas," is a table for triangular prisms, and it will give the approximate volume of triangular prismoids in cubic yards for a length of one hundred feet, between the parallel triangular ends, by taking the sum of the two numbers found with the base and altitude of each of the two end triangles as arguments. The table is thus independent of side slope, or width of roadbed, and will apply to borrow pits, trenches, etc., by dividing up the cross sections into triangles and trapezoids.

The method of dividing up the sections for three-level, five-level and irregular ground, while not essential, is believed to give the least labor in computing, either with or without tables.

The method for irregular ground is due to J. W. Davis, and was published in his *Formula for R. R. Earthwork*, 1876.

The Table for "Prismoidal Corrections" is a table for triangular prismoids, and it will give the exact correction to be applied to the approximate volume found above for all solids which can be divided into triangular prismoids, having plane parallel ends, and planes or hyperbolic paraboloids for side faces. By using A. M. Wellinghton's method for irregular ground, that for the purposes of the prismoidal correction only, the ground may be called regular, the correction is easily and quickly applied, to three-level, five-level, and irregular ground. It may be noted that when either the bases or altitudes of the end triangles are equal, the correction diappears.

While quantities are only given for full feet the corrections for tenths are easily taken out from the margin without multiplication and can be added mentally with but slight increase of labor.

The Tables have been carefully recomputed in print, and it is confidently believed they are free from errors.

PREFACE TO THE SECOND EDITION.

The first edition was not electrotyped, and advantage has been taken of this to entirely recast the text, adding a proof of the prismoidal formula and a comparison with others in use, a formula for correction for curvature, and rules for cross sectioning.

PREFACE TO THE FIFTH EDITION.

Since these tables were first published in 1886, the method of plotting cross sections and measuring the areas with planimeter has come into extensive use, especially for highway work.

In realinement and grade reduction work the profile does not indicate the yardage of cut and fill as in new work, the excavation normally being in the bottom of the old cut and the fill on the top of the old bank, so that the side slopes extend out to include both the old and new, while the center line shows only the new. For these conditions the plotted sections will aid in adjusting the new grade to the profile. This is especially true for highway work where the leads are usually short and the cuts and fills are balanced locally. There is also a sense of security in having a cross section plotted to scale for inspection and record.

But the methods here given for three-level, five-level and irregular ground furnish just as reliable records, are more accurate and when used in connection with the tables more rapid than those by plotting cross sections. The tabulation of the factors which give area in adjacent sections shows at a glance where intermediate sections should have been taken for reliable results by the method of averaging end areas by showing where the product of difference of heights by difference of widths is large; an intermediate section reducing the error to one half.

The Table of Triangular Prismoids for Railway Earthwork has been extended to include heights from 50 to 60 feet and widths from 100 to 150 feet and the Table of Cubic Yards per Station for Center Heights from 0 to 60 feet and for Transverse Slopes from 0 to 28 degrees has been extended to include double as well as single track. These extensions have been made to cover the heavy work which is more common than formerly.

ITHACA, N. Y., June, 1916.

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Derivation of Prismoidal Formula and Comparison with Others in Use.

1. Prismoidal Formula.—In laying out railroad earthwork, sections are taken perpendicular to the center line at stations 100 feet apart and at intermediate points as required. On these sections the center and slope stake points are determined and as many intermediate ones as may be necessary.

These points are connected by straight lines for the cross sections, and a straight line generatrix is moved along corresponding lines of adjacent sections so as to divide the directrices proportionately, *i. e.*, Fig. 1,

$$\frac{d}{d'} = \frac{e}{e'},$$

and similarly for the position of the generatrix shown on the other side of the center line. The surface so formed on each side of the center line is a hyperbolic paraboloid; planes parallel to the ends A, A' will also cut straight lines from the surface; both sets of elements must follow the ground surface, or equalize it, for accurate results for volume. For convenience, the side slope planes are produced to intersect under the roadbed, giving two triangular prismoids which may be taken together or separately; a triangular prismoid being defined as a solid with triangular bases lying in parallel planes, joined by two planes and a hyperbolic paraboloid for side faces.

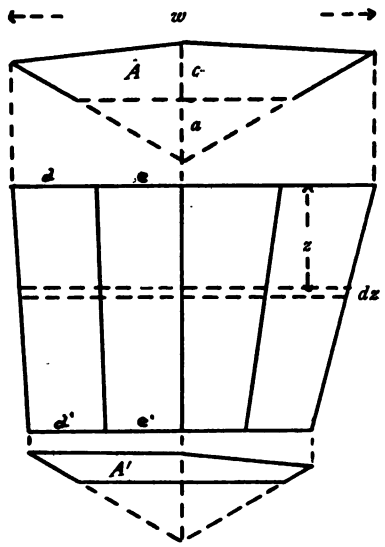

FIG. 1.

To determine the volume for total horizontal distance w and height $k(=a+c)$ at first end and w' and k' at second end, take a section at distance z from first end, with area

$$A_z = \tfrac{1}{2}\left[w + (w' - w)\frac{z}{l}\right]\left[k + (k' - k)\frac{z}{l}\right] \qquad (a)$$

Elem. Vol. $= A_z\,dz$

Volume, $V = \int_0^z A_z\,dz$

$$= \tfrac{1}{2}\int_0^l \left[wk + w(k'-k)\frac{z}{l} + k(w'-w)\frac{z}{l} + (k'-k)(w'-w)\frac{z^2}{l^2}\right]dz$$

$$= \tfrac{1}{2} l \left[wk + w(k' - k)\tfrac{1}{2} + k(w' - w)\tfrac{1}{2} + (k' - k)(w' - w)\tfrac{1}{3} \right]$$

$$= \tfrac{1}{6} l \left[3wk + \tfrac{3}{2} w(k' - k) + \tfrac{3}{2} k(w' - w) + (k' - k)(w' - w) \right]$$

$$= \tfrac{1}{6} l \left[\tfrac{1}{2} wk + \tfrac{1}{2} w' k' + \tfrac{1}{2} (wk + wk' + w'k + w'k') \right]$$

$$V = \tfrac{1}{6} l (A + A' + 4A_m) \qquad (1)$$

where A and A' are the areas of the end sections and A_m that of the mid section found by making $z = l/2$ in (a);

I. e., the true volume equals the sum of the areas of the end sections and four times that of the mid section, multiplied by one-sixth the perpendicular length between sections.

This is the prismoidal formula, and in a general form its first proof was due to Newton (Methodus Differentialis, 1711).

In Fig. 1 it should be noted that the common side k of the two triangles cut by any plane parallel to the ends is vertical, so that the product $k\,w$ gives the double area regardless of the warp of the surfaces.

If there were several segments in the end sections of Fig. 1, giving an equal number of hyperbolic paraboloids fitting the surface, planes could be passed through the corresponding vertices dividing the solid into triangular prismoids, the volumes of which could be determined by (1).

If a ridge or hollow at one section runs out at the next the vanishing point should be noted as its positiou will usually affect the volume.

Thus in Fig. 2, if the triangle A representiug excess material at the first end vanishes into a point on the line $B\ C$ at the second end, a plane parallel to the first end and distant z will cut a triangle from the solid with $D\ E$ for base and the piercing point of the element through R to the vanishing point for vertex. As the vanishing point moves along $B\ C$ the altitude of the triangle will vary reaching its greatest value for C and the smallest for B. This will hold for every position of the cutting plane between the end sections, hence the volume will vary with the position of the vanishing point except when the excess material is limited by a plane, *i. e.*, when the base of the triangle A is parallel to $B\ C$.

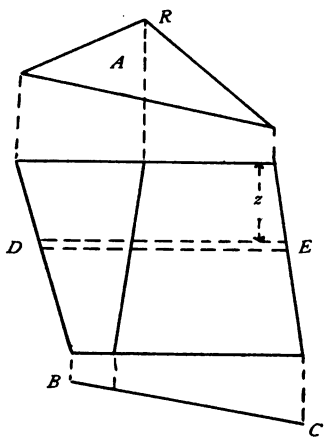

FIG. 2.

2. **Averaging End Areas.**—This is a method in common use on account of its simplicity. Applying it to the triangular prismoid of § 1, with the notation of Fig. 1,

$$\text{Vol.}_a = \left[wk + w'k'\right]\frac{l}{4}$$
$$= \left[3wk + 3w'k'\right]\frac{l}{12}$$

From just above (1),

$$\text{Vol.}_p = \left[wk + w'k' + wk + wk' + w'k + w'k'\right]\frac{l}{12}$$

Subtracting Vol.$_a$ from Vol.$_p$,

$$\text{Vol.}_p - \text{Vol.}_a = \left[-wk - w'k' + wk' + w'k\right]\frac{l}{12}$$

Or,

$$\left.\begin{aligned}\text{Cor.}_a &= \left(w - w'\right)\left(k' - k\right)\frac{l}{12} \\ &= \left(w - w'\right)\left(c' - c\right)\frac{l^*}{12}\end{aligned}\right\} \qquad (2)$$

where Cor.$_a$ is the correction to be applied to the volume found by averaging end areas in order to obtain the true volume.

Usually in passing from lighter to heavier work $w' > w$ and $c' > c$ (or conversely from heavier to lighter), making the above correction usually negative; *i. e.*, the method by averaging end areas gives on the average too large a volume.

It may be noted that halving the distance between stations will halve each factor, or reduce the correction to one-eighth for each half, or to one-quarter for the section. When this method is used without correction advantage should be taken of this fact and plus stations taken whenever the area of the cross sections is changing rapidly.

In this manner the correction can be made as small as desired, but at the expense of increased labor, in both field and office.

3. **Middle Areas.**—In this method the linear dimensions of the mid section will be the means of the corresponding dimensions of the end sections, giving,

$$\text{Vol.}_m = \left(w + w'\right)\left(k + k'\right)\frac{l}{8} = 3\left(w + w'\right)\left(k + k'\right)\frac{l}{24}.$$

Subtracting this from the true value just above (1),

$$\text{Vol.}_p - \text{Vol.}_m = \left[4wk + 4w'k' + 2wk' + 2w'k - 3(w + w')(k + k')\right]\frac{l}{24}$$
$$= \left[wk + w'k' - wk' - w'k\right]\frac{l}{24}$$

*Since a, Fig. 1, is the altitude of the grade triangle, found by extending the side slopes to intersect under, or over, the roadbed and c is the center height, $k' - k = c' - c$.

Or,

$$\left.\begin{aligned}\text{Cor.}_{m} &= \left(w - w'\right)\left(k - k'\right)\frac{l}{24} \\ &= \left(w - w'\right)\left(c - c'\right)\frac{l}{24}\end{aligned}\right\} \qquad (3)^{*}$$

where Cor.$_{m}$ is the correction to be applied to the volume found by middle areas in order to obtain the true volume.

This correction is one-half that found by averaging end areas, and has the opposite sign, *i. e.*, the method on the average gives results too small, but the error is only one-half as great as by the preceding method.

In this method the correction can also be reduced by taking sections nearer together when the area is changing rapidly. The method is not used so much as that of averaging end areas.

4. **Equivalent Mean Heights.**—In this method the center height of a level section having an equal area is found for each end section,

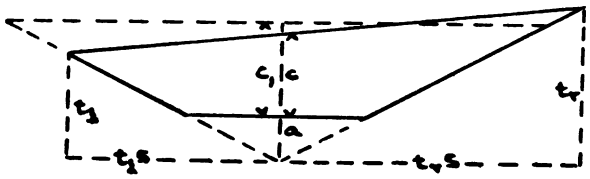

FIG. 3.

and the volume of the reduced solid is then accurately found by the prismoidal formula.

Applying this to two-level ground, with slope stake heights t_l, t_r, slope ratio s, reduced center height c_1, and distances out to slope stakes $t_l s$ and $t_r s$,

$$A = \tfrac{1}{2}\left(t_l + t_r\right)\left(t_l + t_r\right)s - \tfrac{1}{2}t_l^2 s - \tfrac{1}{2}t_r^2 s = t_l t_r s$$

From the reduced area,

$$A = (a + c_1)^2 s$$

or

$$a + c_1 = \sqrt{t_l t_r}$$

and the mid section,

$$A_m = \left(\frac{a + c_1}{2} + \frac{a + c_1'}{2}\right)^2 s$$

The true volume of the *reduced* solid,

$$\text{Vol.}_e = \left(A + A' + 4A_m\right)\frac{l}{6}$$

$$= \left[(a + c_1)^2 + (a + c_1')^2 + 4\left(\frac{a + c_1}{2} + \frac{a + c_1'}{2}\right)^2\right]\frac{s\,l}{6}$$

$$= \left[t_l t_r + t_l' t_r' + \left(\sqrt{t_l t_r} + \sqrt{t_l' t_r'}\right)^2\right]\frac{s\,l}{6}$$

*See foot-note to (2).

The true volume of the *original* solid,

$$\text{Vol.}_p = (A + A' + 4A_m)\frac{l}{6}$$

$$= \left[t_l t_r + t_l' t_r' + 4\left(\frac{t_l + t_l'}{2} \times \frac{t_r + t_r'}{2}\right)\right]\frac{s\,l}{6}$$

$$= [2t_l t_r + 2t_l' t_r' + t_l t_r' + t_l' t_r]\frac{s\,l}{6}$$

Subtracting the volume of the reduced solid from that of the original one,

$$\text{Vol.}_p - \text{Vol.}_e = [t_l t_r' - 2\sqrt{t_l t_r t_l' t_r'} + t_l' t_r]\frac{s\,l}{6},$$

or,

$$\text{Cor.}_e = (\sqrt{t_l t_r'} - \sqrt{t_l' t_r})^2 \frac{s\,l}{6} \qquad (4)$$

The correction is thus always positive, *i.e.*, the method always gives too small a result for two-level ground, except when $t_l t_r' = t_l' t_r$; hence it will usually give too small results for ordinary ground.

In Lyons Tables this method is used. An auxiliary table gives the reduced center height for each end if the section is not horizontal. With the reduced center heights at the two ends as arguments the true volume in cubic yards of this reduced solid by the prismoidal formula can be taken from the table. This is convenient for preliminary estimates, but as the true volume of the reduced solid differs from that of the real solid it is hardly suitable for final estimates.

5. **Triangular Prismoid with Curved Center Line.**—In curving the center line of the roadbed to the radius R, let the dimensions of all the cross sections remain unchanged. This will give the solid easiest to approximate in the field, and the one most like the prismoid, since all lineal dimensions of the cross section can be interpolated.

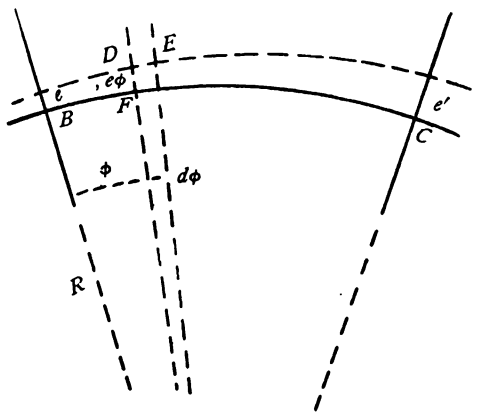

FIG. 4.

In Fig. 4, let $B\,C$ be the center line of the roadbed; e, $e\phi$, e', the eccentricities of the sections, or the distances of their centers of gravity from the center of the roadbed; A, $A\phi$, A', the areas of the triangular sections, with bases, b, $b\phi$, b', and altitudes a, $a\phi$, a'; ϕ the central angle from B to any point F; l the length $B\,C$ of the solid along the center line of the roadbed, $= R\phi'$.

At any point D,

$$\text{Elementary volume} = A_\phi \overline{DE} = A_\phi (R + e_\phi) d\phi$$

$$\text{Volume} = \int_0^{\phi' = \frac{l}{R}} A_\phi \,(R + e_\phi) d\phi$$

Since all cross section dimensions can be interpolated,

$$A_\phi = \tfrac{1}{2}\left[b + (b' - b)\frac{\phi R}{l}\right]\left[a + (a' - a)\frac{\phi R}{l}\right]$$

$$e_\phi = e + (e' - e)\frac{\phi R}{l}$$

Substituting,

$$\text{Volume} =$$

$$\int_0^{\phi' = \frac{l}{R}} \tfrac{1}{2}\left[b + (b' - b)\frac{\phi R}{l}\right]\left[a + (a' - a)\frac{\phi R}{l}\right]\left[R + e + (e' - e)\frac{\phi R}{l}\right] d\phi$$

$$= \tfrac{1}{2}\left[\left[ab\phi + a(b' - b)\frac{\phi^2 R}{2l} + b(a' - a)\frac{\phi^2 R}{2l} + (a' - a)(b' - b)\frac{\phi^3 R^2}{3l^2}\right] R\right.$$

$$+ \left[ab\phi + a(b' - b)\frac{\phi^2 R}{2l} + b(a' - a)\frac{\phi^2 R}{2l} + (a' - a)\,(b' - b)\frac{\phi^3 R^2}{3l^2}\right] e$$

$$\left. + \left[ab\frac{\phi^2}{2} + a(b' - b)\frac{\phi^3 R}{3l} + b(a' - a)\frac{\phi^3 R}{3l} + \right.\right.$$

$$\left.\left.(a' - a)\,(b' - b)\frac{\phi^4 R^2}{4l^2}\right](e' - e)\frac{R}{l}\right]_0^{\phi' = \frac{l}{R}}$$

$$= \tfrac{1}{2}\, l \left[ab + a(b' - b)\tfrac{1}{2} + b(a' - a)\tfrac{1}{2} + (a' - a)(b' - b)\tfrac{1}{3}\right.$$

$$+ \left[ab + a(b' - b)\tfrac{1}{2} + b(a' - a)\tfrac{1}{2} + (a' - a)(b' - b)\tfrac{1}{3}\right]\frac{e}{R}$$

$$\left. + \left[ab\tfrac{1}{2} + a(b' - b)\tfrac{1}{3} + b(a' - a)\tfrac{1}{3} + (a' - a)\,(b' - b)\tfrac{1}{4}\right]\frac{(e' - e)}{R}\right]$$

$$= \frac{l}{6}\left[ab + \tfrac{1}{2}ab' + \tfrac{1}{2}a'b + a'b'\right.$$

$$+ (ab + \tfrac{1}{2}ab' + \tfrac{1}{2}a'b + a'b')\frac{e}{R}$$

$$\left. + (\tfrac{1}{4}ab + \tfrac{1}{4}ab' + \tfrac{1}{4}a'b + \tfrac{1}{4}a'b')\frac{e' - e}{R}\right]$$

$$= \frac{l}{6}\left[(A + 4A_m + A') + (A + 4A_m + A')\frac{e}{R} + (2A_m + A')\frac{e' - e}{R}\right]$$

$$\text{Volume} = \frac{l}{6}\left(A + 4A_m + A'\right) + \frac{l}{6R}\left[(A + 2A_m)e + (2A_m + A')e'\right] \quad (5)$$

where A_m is the area of the mid section, and e, e', are positive for the convex side of the curve.

The first product is the volume which would be obtained by the prismoidal formula neglecting curvature, leaving the second for the correction due to curvature.

6. **Effect of Vertical Curvature.**—The effect of the vertical curves used in connecting uniform gradients is to curve the roadbed and side slopes so that the longitudinal elements will be curved, not straight. This will increase the volume over that given by the cross sections, if the curve is concave toward the solid, or decrease it if it is convex. The curve usually used is the parabola, although for flat arcs it does not differ sensibly from the circle. The area between the vertical parabolic arc and the straight line chord joining the same points of the adjacent cross sections equals the horizontal length of the chord into two-thirds the middle vertical ordinate. This area is constant for roadbed and side slopes, so that the volume can be found by multiplying by the width between slope stakes, *i. e.*, correction for vertical curvature,

$$\text{Cor.}_{\text{v. c.}} = \frac{2}{3} l\, m\, w \qquad (6)$$

where l = length, m = middle ordinate, w = width.

Volume for Railway Earthwork

IN CUBIC YARDS BY AVERAGING END AREAS.

7. **Formula for Three-Level Ground.**—Dimensions in feet, volume in cubic yards.

$$\text{Area of section} = \frac{f_1}{2}(a+c) + \frac{f_r}{2}(a+c) - \frac{ba}{2}$$

$$= \frac{w}{2}(a+c) - \frac{ba}{2}$$

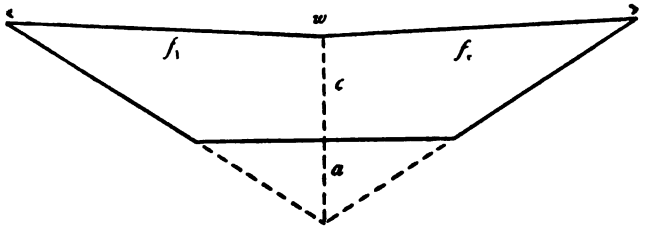

FIG. 5.

At the next section, 100 feet from the first, priming corresponding parts,

$$\text{Area}' = \frac{w'}{2}(a+c') - \frac{ba}{2}$$

Multiplying the average area by the length, and dividing by 27 to reduce to cubic yards,

$$\text{Volume} = (\text{area} + \text{area}')\frac{100}{2 \times 27}$$

$$\text{Volume} = w(a+c)\frac{50}{54} - ba\frac{50}{54} + w'(a+c')\frac{50}{54} - ba\frac{50}{54} \qquad (7)$$

I. e., for cross sections 100 feet apart the effect of each on the adjacent volume in cubic yards is $\frac{50}{54}$ the double area of the section in square feet. For intermediate sections this effect applies to the solid on each side, or the double area is used twice. Thus for the next solid,

$$\text{Volume}' = (\text{area}' + \text{area}'')\frac{100}{54}.$$

The terms comprising *area'* should therefore be added separately, for convenience in finding the second volume, etc.

8. **Five-Level Ground.**—For five-level ground the intermediate heights, t_1 and t_r, are taken over (or under) the edges of the roadbed. By joining the edges of the roadbed with the ground at the center, two triangles are formed on the left having t_1 for the common base, f_1 for

the sum of the altitudes, and $f_1 t_1$ for double area; two on the right with double area, $f_r t_r$, and one at the center with double area $b c$.

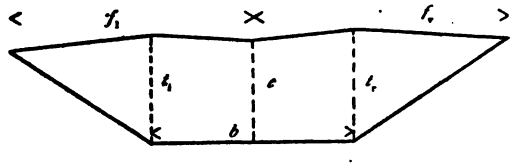

FIG. 6.

Therefore,

$$\text{Area first end} = \frac{f_1 t_1}{2} + \frac{f_r t_r}{2} + \frac{b c}{2}$$

$$\text{Area second end} = \frac{f_1' t_1'}{2} + \frac{f_r' t_r'}{2} + \frac{b c'}{2}$$

$$\text{Vol.} = f_1 t_1 \frac{50}{54} + f_r t_r \frac{50}{54} + b c \frac{50}{54} + f_1' t_1' \frac{50}{54} + f_r' t_r' \frac{50}{54} + b c' \frac{50}{54} \quad (8)$$

It may be noted that five-level ground requires three products for the area of the section instead of only one for three level ground, but it does away with the addition of the altitude of the grade triangle to the center height and with the subtraction of the area of the grade triangle.

9. **Irregular Ground.**—In Fig. 7, let $f_1, g_1, h_1, \ldots$ and $f_r, g_r, h_r, \ldots$ = the distances to the left, and right, to the slope stakes, and intermediate breaks in the ground surface; and $r_1, t_1, u_1, \ldots$ and $r_r, t_r, u_r \ldots$ = the corresponding heights.

The area of the section may be found by taking the two triangles with the common base $a + c$, and altitudes f_1 and f_r, adding the triangle with area $\frac{f_1}{2} \cdot GH$, and subtracting the triangle with area $\frac{g_1}{2} \cdot DE$ and the grade triangle $\frac{b a}{2}$. This gives,

Area first end (the right side being regular)

$$= \frac{f_1}{2}(a+c) + \frac{f_1}{2} \cdot \overline{HG} - \frac{g_1}{2} \cdot \overline{DE} \pm \text{etc.} + \frac{f_r}{2}(a+c) - \frac{b a}{2}$$

$$= \frac{f_1}{2}(a+c) + \frac{f_1}{2}(t_1 - c - \overline{IG}) + \frac{g_1}{2}(u_1 - c - \overline{FE}) + \text{etc.} + \frac{f_r}{2}(a+c) - \frac{ba}{2},$$

where IG and FE are to be taken as negative if measured below the horizontal line FI. Expressing them in terms of measured quantities, since $IG = (r_1 - c)\frac{g_1}{f_1}$ and $FE = (t_1 - c)\frac{h_1}{g_1}$,

Area first end

$$= \frac{f_1}{2}(a+c) + \frac{f_1}{2}\left[t_1 - c - \frac{g_1}{f_1}(r_1 - c)\right] + \frac{g_1}{2}\left[u_1 - c - \frac{h_1}{g_1}(t_1 - c)\right] + \text{etc.}$$
$$+ \frac{f_r}{2}(a+c) - \frac{ba}{2}$$

$$= \frac{f_1}{2}(a+t_1) + \frac{g_1}{2}(u_1-r_1) + \frac{h_1}{2}(c-t_1) + \text{etc.} \quad + \frac{f_r}{2}(a+c) - \frac{ba}{2},$$

where each break or intermediate height H, D, etc., adds a term of the form $\frac{g_1}{2}(u_1-r_1)$. If H is omitted, the corresponding term $\frac{g_1}{2}(u_1-r_1)$ disappears and the other term becomes $\frac{h_1}{2}(c-r_1)$, as may be found by leaving off the triangle $\frac{f_1}{2} \cdot GH$; if H and D are omitted both terms disappear, and $\frac{f_1}{2}(a+t_1)$ becomes $\frac{f_1}{2}(a+c)$, as may be seen from the expression for the right side.

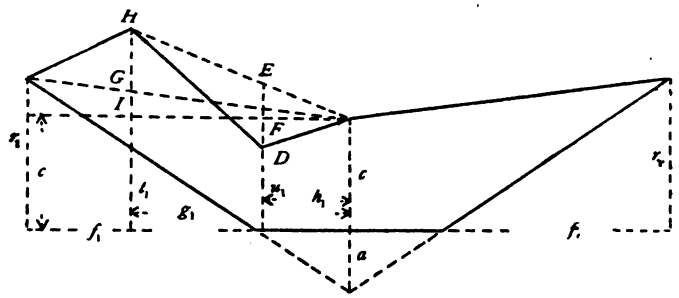

FIG. 7.

If the next cross section, 100 feet distant, is similar to the first, and the same letters with primes are used for corresponding parts, we shall have,

Area second end,

$$= \frac{f_1'}{2}(a+t_1') + \frac{g_1'}{2}(u_1'-r_1') + \frac{h_1'}{2}(c'-t_1') + \text{etc.} \quad + \frac{f_r'}{2}(a+c') - \frac{ba}{2}.$$

The volume will be found by multiplying the average area by the length, and dividing by 27 to reduce to cubic yards.

$$\text{Volume in cubic yards} = (\text{area} + \text{area}') \frac{100}{2 \times 27}.$$

Substituting the value of each end area,

Volume

$$= f_1(a+t_1)\tfrac{50}{54} + g_1(u_1-r_1)\tfrac{50}{54} + h_1(c-t_1)\tfrac{50}{54} + \text{etc.} \quad + f_r(a+c)\tfrac{50}{54} - ba\tfrac{50}{54}$$
$$+ f_1'(a+t_1')\tfrac{50}{54} + g'_1(u'_1-r'_1)\tfrac{50}{54} + h'_1(c'-t_1')\tfrac{50}{54} + \text{etc.} + f_r'(a+c')\tfrac{50}{54} - ba\tfrac{50}{54} \qquad (9)$$

I. e., for the factors to be used in finding volume: On each side, take the slope stake distance into the adjacent height added to the altitude of the grade triangle; then each intermediate distance out into the difference of adjacent heights, the one nearer the center being positive. From the sum of the products subtract the grade prism.

If there are no intermediate heights the height next the slope stake is the center height and the method reduces to that for three-level ground.

A more obvious method of dividing an irregular section into triangles or trapezoids would be simpler for demonstration, but it would involve more labor in computation on account of the greater number of triangles involved.

10. **Tables.**—The products required for volume in cubic yards, being fifty fifty-fourths of the double areas of the corresponding triangles in square feet, can be most readily obtained from tables, using the width and height of the triangle in each case for arguments.

The tables give products for all widths from 0 to 150 feet and for all heights from 0 to 60 feet, covering the range for fairly heavy earthwork.

If any factor exceeds the limits of the table separate it into two unequal parts; take out the product for each part with the other factor and add: if both factors exceed the limits, separate each into two unequal parts and look out the product of each of one with both the others and add. Unequal parts reduce the tendency to accumulation of inaccuracy.

To look out the yardage for a given product or triangle:—

Look out the integral part of the width in the Width column at the left and the integral part of the height at the top of the page: place the left hand forefinger at the intersection of the line and column, say 80 and 25, giving 1852: then for 0.3 extra height (the extra width being over 0.5) place the left hand little finger in the 0.3 Corrections for tenths of height column opposite 81, giving 23; then for 0.8 extra width, place the thumb opposite 0.8 and under 25 in the Corrections for tenths of width column, giving 19; add the three mentally, each being indicated by a thumb or finger, giving 1894 for the yardage.

Again, 64.5 and 21.8 for width and height will give, 1244 + 47 or 48 + 10=1301 or 1302.

For 40.8 and 160.7; 40.8 and 78 will give 2947; 40.8 and 82.7 will give 3125; total 6072.

For 105 and 160.7; 50 and 100 will give 4630; 50 and 60.7 will give 2810; 55 and 100 will give 5093; 55 and 60.7 will give 3092; total 15625.

In order to impress upon the mind the fact that the correction for tenths of width is placed under the height column, it should be remembered that the differences down the column are constant, so that corrections or proportional parts of these differences can be placed under it, but the widths are increased as we move down the column, or these corrections are for tenths of width. Similarly for the lines horizontally, or the corrections for tenths of height.

After becoming familiar with the table, it will often save time to call height "width," and width "height," and to take the correction for tenths from the side or bottom of the page as most convenient, *provided* always that it is opposite (or under) the heading number to which it belongs.

11. **Example, Three-level Ground—**

Sta.	Center.	Left	Right.
20	10.8,	$\frac{8.4^*}{19.6}$,	$\frac{11.4}{24.1}$
21	24.2,	$\frac{11.1}{23.7}$,	$\frac{32.6}{55.9}$
21+20	46.7,	$\frac{20.0}{37.0}$,	$\frac{50.6}{82.9}$

$a = 4.7$, $b = 14$.†

$$a = \frac{b}{2} \div s = \frac{14}{2} \div \frac{1\frac{1}{2}}{1} = 4.7.$$

Substituting in formula (7), we shall have, in connection with § 10:

Sta. 20.

$w = 19.6 + 24.1 = 43.7$, $a + c = 4.7 + 10.8 = 15.5$.

From the Table of Triangular Prismoids,

Under height 15, right of width 43	597	
Left of width 44, correction for 0.5	20	
Under height 15, correction for 0.7	10	
	627	
Arguments, $b = 14$ and $a = 4.7$ (grade prism)	—61	566

Sta. 21,

$w' = 23.7 + 55.9 = 79.6$, $a + c' = 4.7 + 24.2 = 28.9$	2131	
$b = 14$, $a = 4.7$	—61	2070
		2636
From above, for sta. 21	2070	
Sta. 21 + 20,		
$w' = 37.0 + 82.9 = 119.9$, $a + c'$ $4.7 + 46.7 = 51.4$	5706	
$b = 14$, $a = 4.7$ (grade prism)	— 61	5645
	7715	
Total in cubic yards, 7715 × .20 =		1543
Grand total		4179

12. **Example, 5-Level Ground—**

Sta.	Center.	Left.		Right.	
46	10.8,	$\frac{11.4}{7}$	$\frac{12.1}{25.1}$	$\frac{9.9}{7}$	$\frac{8.6}{19.9}$
47	6.4,	$\frac{6.8}{7}$	$\frac{7.2}{17.8}$	$\frac{5.7}{7}$	$\frac{5.0}{14.5}$

* The numerator is the height above or below grade at the point and the denominator is its distance from the center.

† The side slope s is here assumed to be one and one-half horizontal to one vertical, so that

By formula (8), using the Table for multiplications :

Sta. 46, arguments,	25.1,	and 11.4,	265	
"	19.9,	" 9.9,	183	
"	14.0,	" 10.8,	140	588
Similarly for Sta. 47,				272
Total in cubic yards,				860

13. **Example, Irregular Ground.**—

Sta.	Center.	Left.		Right.	
20	10.8		8.4 / 19.6	11.2 / 18	11.4 / 24.1
21	24.2, 18.6 / 16	11.1	23.7	20.4 / 42	32.6 / 55.9
21+20	46.7, 40.7 / 20	20.0	37.0	48.1, 50 / 58	50.6 / 82.9

$b = 14$, $s = 1.5$ to 1, $a = 4.7$.

By formula (9) :

Volume from sta. 20 to sta. 21.

$f_1 = 19.6$, $a + c = 4.7 + 10.8 = 15.5$; $f_r = 24.1$, $a + t = 4.7 + 11.2 = 15.9$;
$g_r = 18$, $u_r - r_r = 10.8 - 11.4 = -0.6$; $b = 14$, $a = 4.7$.

Under height 15, right of width 19	264	
Left of width 20, cor. for 0.5	9	
Under height 15, cor. for 0.6	8	
		281
Arguments, 24.1 and 15.9		354
18 " 0.6		−10
14 " 4.7 (grade prism)		−61
		564

Sta. 21, Arguments.

23.7 and 4.7 + 18.6 = 23.3	512	
16 " 24.2 − 11.1 = 13.1	194	
55.9 " 4.7 + 20.4 = 25.1	1299	
42 " 24.2 − 32.6 = −8.4	−327	
14 " 4.7 (grade prism)	−61	
		1617
Total in cubic yards		2181

Sta. 21 + 20, Arguments.

37 and 4.7 + 40.7 = 45.4	1556	
20 " 46.7 − 20 = 26.7	494	
82.9 " 4.7 + 50 = 54.7	4200	
58 " 48.1 − 50.6 = 2.5	−134	
20 " 46.7 − 50 = −3.3	− 62	
14 " 4.7 (grade prism)	− 61	
		5993
		7610
7610 × .20		1522
		3703

Any other method of dividing the sections into triangles can be used if preferred, although it will result in increased labor.

14. **Borrow Pits.**—In borrow pits, ditches or other work, where the cross sections are made up of triangles or trapezoids, take the altitude and base of each triangle, or the sum of the parallel sides, and the perpendicular distance between them for each trapezoid, as arguments, as with the two sections below.

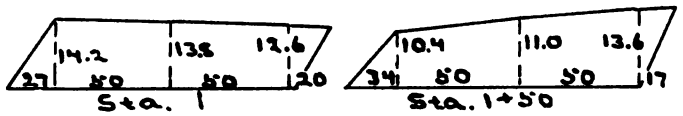

FIG. 8.

Sta. 1, 27 and 14.2 ---- 355
50 " 28.0 ---- 1296
50 " 26.4 ---- 1223
20 " 12.6 ---- 233
—— 3107
Similarly for sta. 1 + 50, 2672
5779
5779 × .50 = 2890 cu. yards

15. **Sidehill Work.**—When a "grade point" occurs in a cross section, one side being in cut, the other in fill, no attempt should be made to compute both cut and fill together, but each should be taken separately and followed through, keeping the cuts and the fills entirely separate in summing up results.

EXAMPLE.

Sta.	Center.	Left.	Right.
46	—2.4	0.0 / 4.3 ---- 2.2 / 12.3	— 6.4 / 16.6
+ 60	0.0	1.0 / 10.5	— 7.5 / 18.3
47	1.7	3.8 / 14.7	0.0 / 2.6 — 2.9 / 11.4
+ 20	2.1	4.1 / 15.2	0.0 / 9.0

Roadbed 18 feet in cut, 14 feet in fill, slopes 1½ to 1. Altitude of grade triangle in cut $= 9 \div \frac{1\frac{1}{2}}{1} = 6$, in fill $= 7 \div \frac{1\frac{1}{2}}{1} = 4.7$.

For cutting the notes would be,

46	0.0	0.0 / 4.3 ---- 2.2 / 12.3	
+ 60	0.0	1.0 / 10.5	
47	1.7	3.8 / 14.7	0.0 / 2.6
+ 20	2.1	4.1 / 15.2	0.0 / 9.0

Giving as irregular ground,

Sta. 46,	12.3, and 6 + 0.0, =	6,		69
	4.3,	0 — 2.2, = — 2.2,		— 9
	9,	6 + 0.0, =	6,	50
	Grade triangle, 18 and 6,			— 100
				10
+ 60,	10.5, and 6 + 0.0 = 6,			59
	One-half grade triangle,			— 50
				— 9
				— 19
				19 × .6 11
47,	14.7, and 6 + 1.7 = 7.7,			106
9,	6 + 0.0 = 6,			50
2.6,	1.7—0.0 = 1.7,			5
	Grade triangle. 18 and 6,			— 100
				61
				70 × .4 28
+ 20,	15.2,	6 + 2.1 = 8.1,		113
9,		6 + 2.1 = 8.1,		68
	Grade triangle, 18 and 6,			— 100
				81
				142 × .2 28

Total in cubic yards 67

It is often more convenient in dealing with partial sections to leave out the grade prisms, thus

Sta. 46,	width 9 — 4.3 =	4.7,	height 2.2,	giving	9
+ 60		9	1		8
					17 × .6 = 10
47		17.3	1.7	28	
		9	3.8	32	
				60	68 × .4 = 27
+ .20		24.2	2.1	46	
		9	4.1	34	
				80	140 × .2 = 28

Total in cubic yards 65

For filling the notes would be

Sta.	Center.	Left.	Right.
46	— 2.4	0.0 / 4.3	— 6.4 / 16.6
+ 60	0.0		— 7.5 / 18.3
47		0.0 / 2.6	— 2.9 / 11.4
+ 20			0.0 / 9.0

Giving,

Sta. 46	20.9 and	2.4	47			
	7	6.4	42			
			—	89		
+ 60	7	7.5	48	48		
			—	—	137 × .6	82
47	4.4	2.9	11		59 × .4	24
+ 20	0	0			11 × .2	2
						—
	Total in cubic yards					108

16. **End Sections.**—A cross section should be taken wherever either edge of the roadbed or center line in cutting reaches grade. This will require three sections in passing from a cut to a fill, or *vice versa*. The end solid is a pyramid with volume equal to area of base into one-third the altitude, or it may be taken under the rule, base into one-half the altitude, and afterwards corrected by the prismoidal formula.

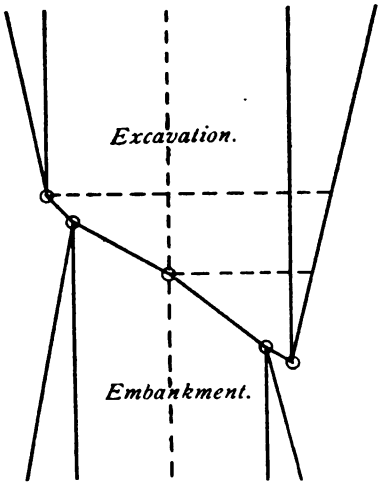

FIG. 9.

The roadbed in fill is usually narrower than in cut as side ditches are not necessary for drainage. This would require two grade points at the edge of the roadbed as indicated, but in light work where the end volumes contain but a few cubic yards each, sometimes the center, and sometimes the side grade points, are omitted to save labor in the field. These points should then be found by interpolation in computing volume.

The solid in fill, between the two end sections, can usually be taken as having the same altitude, the volume not being required as accurately as for cut; the exact values can be interpolated when necessary.

If the roadbed in fill stops abruptly and the slope is carried around the end of the embankment, Fig. 10, as in joining a wooden trestle, vertical planes through the corners of the roadbed will cut off two partial cones and leave a central wedge.

In taking cross sections for volume, they should radiate from the corners of the roadbed or axes of the cones for the curved portions, and be parallel to the ends of the wedge for the central portion. The

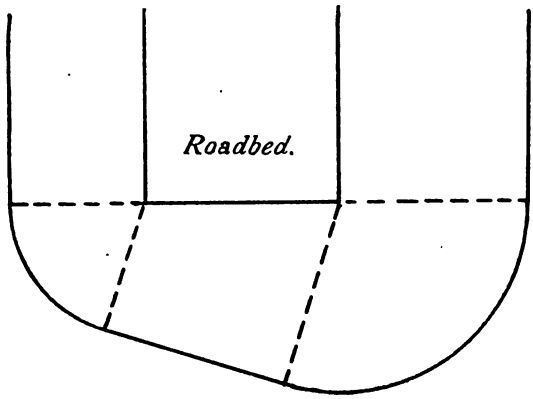

FIG. 10.

curved distances between the centers of gravity of the cone sections will give the lengths in finding volume.

17. **Correction for Curvature.**—For a solid corresponding to the triangular prismoid, as described in §5, we have from (5),

$$\text{Correction} = \frac{l}{6R}\left[(A + 2A_m)e + (2A_m + A')e'\right] \qquad (10)$$

$$= \frac{l}{2R}\left[Ae + A'e'\right] \text{(Approx.)} \qquad (11)$$

The latter equation is the one in common use, giving, with less labor, sufficient accuracy for ordinary earthwork solids.

Three-level Ground.—To find e, the eccentricity of the center of gravity, we have,

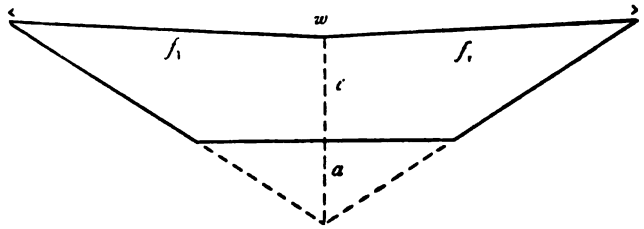

FIG. 11.

For the right side,

$$\text{Area} = \frac{f_r}{2}(a + c)$$

$$\text{Center of gravity from center line} = \frac{f_r}{3}$$

$$(\text{Product})_r = \frac{f_r^2}{6}(a + c)$$

Similarly, for the left side,

$$(\text{Product})_l = -\frac{f_l^2}{6}(a+c)$$

Hence $$e = \frac{(\text{product})_r + (\text{product})_l}{\text{total area}} = \frac{\frac{f_r^2 - f_l^2}{6}\ a+c}{\frac{f_r+f_l}{2}\ a+c}$$

Or, $$e = \frac{f_r - f_l}{3} \qquad (12)$$

$$\text{Correction} = \frac{l}{6R}\left[A(f_r - f_l) + A'(f_r' - f_l')\right] \qquad (13)$$

where A and A' must include the grade triangle.

Or, $$\text{Correction}_y = \frac{1}{3R}\left[Q(f_r - f_l) + Q'(f_r' - f_l')\right] \qquad (14)$$

where Q and Q' are the tabular quantities or volumes corresponding to A and A' ($A = \frac{27}{50}Q$) and Correction_y is in cubic yards.

Five-level and irregular ground can usually be taken as three-level, with the same distances to slope stakes, for the purposes of this correction, unless the intermediate heights show a marked tendency to lie above, or below, the lines joining the side heights with the center, when the section can be plotted and an equalizing line drawn, or in extreme cases each triangular prismoid can be taken separately by (11).

Sidehill Ground, neglecting all breaks between slope stakes. The center of gravity will be on the line joining the center of the base with the vertex, at one-third its length from the base.

The distance from the lower end of this line to the center, Fig. 12.

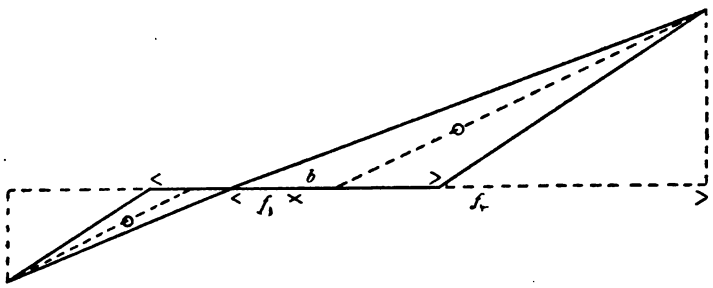

FIG. 12.

$$= \frac{b}{2} - \left(\frac{b}{2} + f_l\right)\tfrac{1}{2} = \frac{b}{4} - \frac{f_l}{2}$$

Distance from the upper end $= f_r$.

Hence $$e = \tfrac{2}{3}\left(\frac{b}{4} - \frac{f_l}{2}\right) + \tfrac{1}{3}f_r = \tfrac{1}{3}\left(\frac{b}{2} - f_l + f_r\right) \qquad (15)$$

where f_l will be positive if the grade point is on the same side of the center as the slope stake.

Substituting in (11),

$$\text{Correction} = \frac{l}{6R}\left[A\left(\frac{b}{2} - f_l + f_r\right) + A'\right)\frac{b}{2} - f_l' + f_r'\right] \quad (16)$$

$$\text{Correction}_y = \frac{1}{3R}\left[Q\left(\frac{b}{2} - f_l + f_r\right) + Q'\left(\frac{b}{2} - f_l' + f_r'\right)\right] \quad (17)$$

18. **Example, Correction for Curvature.**—In the example of § 13, let the center line be on a 7° curve to the right, $R = 5730 \div 7 = 819$, and let the intermediate breaks be omitted in finding the correction for curvature.

Volume from sta. 20 to sta. 21.

Q, including the grade triangle, $= 625$; $Q' = 1678$; $f_l = 9.6$; $f_r = 24.1$; $f_l' = 23.7$; $f_r' = 55.9$.

Substituting in (14),

$$\text{Correction} = \frac{1}{3 \times 819}[625(24.1 - 19.6) + 1678(55.9 - 23.7)] = \quad 23$$

Volume from sta. 21 to sta. 21 + 20,

$$\text{Correction} = \frac{1}{3 \times 819}[1678(55.9 - 23.7) + 6054(82.9 - 37.0)] = 135$$

$$.2 \times 135 \qquad = \quad 27$$

Total in cu. yards = −50

The correction is negative, the center of gravity and the center of the curve lying on the same side of the center line.

In the example of § 15, let the center line be on a 7° curve to the right.

Volume from sta. 46 to sta. 46 + 60.

Substituting in (17),

$$\text{Correction} = \frac{.60}{3 \times 819}[10(9 - 12.3 - 4.3) + 9(9 - 10.5 + 0)] = 0$$

This correction would be positive, the center of gravity and the center of the curve being on opposite sides of the center line.

Prismoidal Correction in Cubic Yards.

19. **Three-level Ground.**—The prismoidal correction to be applied to the volume of a triangular prismoid found by averaging end areas in order to obtain the true volume, has been found to be by (2),

$$\text{Correction} = (w - w')\,(c' - c)\,\frac{l}{12}$$

where w and c are the base and altitude of the triangle at the first end and w' and c' those at the second end.

For three-level ground, per station in cubic yards, this would reduce to

$$\text{Prismoidal cor.} = (w - w')\,(c' - c)\,\frac{50}{3 \times 54} \qquad (18)$$

where, as in Fig. 5 and equation (7), w and w' are the total widths and c and c' are the center heights.

This correction is to be added to the approximate volume found by end areas, it disappears when the widths, or the center heights, are equal, and it can often be neglected without computation when inspection shows one of the factors to be very small.

20. **Five-level Ground.**—The intermediate heights having been taken over (or under) the edges of the roadbed. In § 8, see Fig. 6, each section was divided into three triangles, one having the distance to the left slope stake. f_l, for base, and the height over the left edge of the roadbed, t_l, for altitude, the second the corresponding dimensions f_r, t_r, on the right, and the third the width of roadbed and the center height. Applying (2), and remembering that since the width of roadbed is the same at both ends, the correction for the third triangle will be zero,

$$\text{Pris. cor.} = (f_l - f'_l)\,(t'_l - t_l) + (f_r - f'_r)\,(t'_r - t_r)\,\frac{50}{3 \times 54} \qquad (19)$$

21. **Irregular Ground, Borrow Pits, etc.**—Since the areas of the sections will be made up of triangles, the correction will be made up of as many terms as there are triangular prismoids in the volume, each term being of the form

$$(w - w')\,(c' - c)\,\frac{50}{3 \times 54}.$$

This requires that there should be the same number of breaks at each end of the solid, as already indicated in § 1, in deriving the prismoidal formula and defining the prismoid. If there are not, the distance from the center at which a ridge or hollow runs out at the more regular section should be noted in the field, and the height either noted or computed.

22. **Table of Prismoidal Corrections.**—The table gives the value of $(w - w')\,(c' - c)\,\frac{50}{3 \times 54}$, for $w - w'$ (width — width′) and $c' - c$

(height′ — height) as arguments. This is the correction for a length of 100 feet. If the length is not 100, multiply the result by $\frac{1}{100}$ of the length.

To look out the number :—Find the integral part of the width factor in the width column at the left of the page; then move to the right to the column containing the height factor at the top of the page and note the number; then move down to the bottom of the column (or the next to the right if the tenths of the height factor be greater than 5) and take out the "Correction for tenths of width" — width′; then move to the left on the line containing the integral part of the width factor (or the next below if the tenths of width be 5 or over) and take out the "Correction for tenths of height′ — height." Take the sum of the three mentally for the correction in cubic yards.

If a factor exceeds the limits of the table separate it into two unequal parts; take out the product for each part with the other factor and add : if both factors exceed the limits, separate each into two unequal parts and look out the product of each of one with both the others and add. Unequal parts reduce the tendency to accumulation of inaccuracy.

23. **Example, Three-level Ground.**—See § 11.

Sta.	Center.	Left.	Right.
20	10.8,	$\frac{8.4}{19.6}$,	$\frac{11.4}{24.1}$
21	24.2,	$\frac{11.1}{23.7}$,	$\frac{32.6}{55.9}$
21+20	46.7,	$\frac{20.0}{37.0}$,	$\frac{50.6}{82.9}$

Correction for volume from sta. 20 to sta. 21.

$w - w' = 43.7 - 79.6 = -35.9$; $c' - c = 24.2 - 10.8 = +13.4$

From the Table of Prismoidal Corrections.

Right of argument 35, under 13,		140	
Under " 13, corr. for 0.9		4	
Left of " 36, corr. for 0.4		4	
			— 148

Correction for volume from sta. 21 to sta. 21 + 20.

40.3 and 22.5 as arguments = 272 + 2 + 6 = 280

— 280 × .20 = — 56

Total correction to the volume found by "End areas" = — 204

24. **Example, Five-level Ground.**—

Sta.	Center.	Left.		Right.	
46	10.8,	$\frac{11.4}{8}$	$\frac{12.1}{20.1}$,	$\frac{9.9}{8}$	$\frac{8.6}{16.6}$
47	6.4,	$\frac{6.8}{8}$	$\frac{7.2}{15.2}$,	$\frac{5.7}{8}$	$\frac{5.0}{13.0}$

$b = 16$, side slope ratio $s = 1$ to 1. See Fig. 6 and (19).

$f_1 - f'_1 = 20.1 - 15.2 = 4.9$, $t'_1 - t_1 = 6.8 - 11.4 = -4.6$
$f_r - f'_r = 16.6 - 13.0 = 3.6$, $t'_r - t_r = 5.7 - 9.9 = -4.2$
-4.9 and 4.6 as arguments $= 5 + 1 + 1 = -7$
-4.2 and 3.6 " $= 4 + 1 = -5$

Correction in cubic yards $= -12$

25. **Example, Irregular Ground.**—See § 13.

Sta.	Center.	Left.			Right.	
20	10.8,	$\frac{8.4}{19.6}$			$\frac{11.2}{18}$	$\frac{11.4}{24.1}$
21	24.2,	$\frac{18.6}{16}$	$\frac{11.1}{23.7}$,		$\frac{20.4}{42}$	$\frac{32.6}{55.9}$
21 + 20	46.7,	$\frac{40.7}{20}$	$\frac{20.0}{37.0}$,	$\frac{48.1}{20}$	$\frac{50.0}{58}$	$\frac{50.6}{82.9}$

$b = 14$, $s = 1.5$ to 1, $a = 4.7$.

The break 16 feet out at left of sta. 21 runs out 10 feet left at sta. 20.

The break 20 feet out at right of sta. 21 + 20 runs out at the center at sta. 21.

By interpolation, the height at 10 feet to the left at sta. $20 = 10.8 - \frac{10}{19.6}(10.8 - 8.4) = 9.6$.

Correction for volume from sta. 20 to sta. 21.

Sta. 20 would be written

$$10.8, \quad \frac{9.6}{10} \quad \frac{8.4}{19.6}, \quad \frac{11.2}{18} \quad \frac{11.4}{24.1}.$$

Changing the factors of § 13 which were used in finding volume, or the areas of the triangles, to correspond with the interpolated break,

Arguments, $19.6 - 23.7 = -4.1$; $23.3 - 14.3 = +9.0$. corr. $= -11$
" $24.1 - 55.9 = -31.8$, $25.1 - 15.9 = +9.2$, " -90
" $10 - 16 = -6.0$, $13.1 - 2.4 = +10.7$, " -20
" $18 - 42 = -24.0$, $-8.4 + 0.6 = -7.8$, " $+58$
-63

Correction for volume from sta. 21 to sta. 21 + 20.

Sta. 21 would be written

$$24.2, \quad \frac{18.6}{16} \quad \frac{11.1}{23.7} \quad \frac{24.2}{0} \quad \frac{20.4}{42} \quad \frac{32.6}{55.9}$$

giving as above,

Arguments, $23.7 - 37.0 = -13.3$, $45.4 - 23.3 = +22.1$, corr. $= -90$
" $55.9 - 82.9 = -27.0$, $54.7 - 25.1 = +29.6$, " -247
" $16 - 20 = -4.0$, $26.7 - 13.1 = +13.6$, " -17
" $42 - 58 = -16.0$, $-2.5 + 8.4 = +5.9$, " -29
" $0 - 20 = -20.0$, $-3.3 - 3.8 = -7.1$, " $+44$
-339

$339 \times .20 = -68$

Total correction in cubic yards $= -131$

26. **Example, Borrow Pits.**—See example, § 14.

Arguments, which were used in finding volume; for sta. 1, 27 and 14.2, 50 and 28.0, 50 and 26.4, 20 and 12.6; for sta. 1+50, 34 and 10.4 50 and 21.4, 50 and 24.6, 17 and 13.6.

The corrections will all disappear except for the first and last product at each station.

Arguments, $27-34=-7$, $10.4-14.2=-3.8$, corr. $=+8$
" $20-17=+3$, $13.6-12.6=+1.0$, " $=+1$
9

Correction in yards $=9\times.50=5$.

27. **Example, End Sections.**—

Sta.	Center.	Left.		Right.	
16	−1.4,	$-\frac{0.8}{7}$	$-\frac{1.7}{9.6}$		$\frac{0.0}{9}$
+17	0.0,	$-\frac{0.5}{7}$	$-\frac{1.0}{8.5}$	$\frac{0.6}{9}$	$\frac{1.4}{10.1}$
+80	5.1		$\frac{0.0}{9}$	$\frac{4.9}{9}$	$\frac{6.4}{18.6}$

Roadbed 14 feet and 18 feet, side slopes 1½ : 1.

For cutting the factors would be,

Sta. 16,	0.0 and 0.0,	giving	0.			
+17,	10.1 " 0.6,	"	6	6	6×.17	1
+80,	18.6 " 4.9,	"	86			
	18 " 5.1,	"	85	171	171×.63	108

109 cu. yds.

Prismoidal correction.

Sta. 16 to 16+17, $10.1-0=10.1$ and $0.0-0.6=-0.6$, corr. $=-2$

16+17 to 16+80, $18.6-10.1=8.5$ $0.6-4.9=-4.3$, corr. $=-12$

$9-0.0=9$ $0.0-5.1=-5.1$, corr. $=-14$

-26

$-2\times.17=0$

$-26\times.63=-16$ cubic yards.

Corrected volume, $109-16=93$ cubic yards.

For fill the factors would be,

Sta. 16	9.6 and 0.8,	giving	7		
	14	1.4	18	25	
+17,	8.5	0.5	4	4	$29\times.17=5$
+80,	0.0	0.0	0	0	$4\times.63=3$

Total in cubic yards $=8$

Prismoidal correction.

Sta. 16 to 16+17, $9.6-8.5=1.1$ and $0.5-0.8=-0.3$, corr. $=0$

$14-7=7$ $0.0-1.4=-1.4$, corr. $=-3$

16+17 to 16+80, $8.5-0.0=8.5$ $0.0-0.5=-0.5$, corr. $=-1$

$-3\times.17=-1$
$-1\times.63=-1$
-2 cubic yards

Corrected volume $=8-2=6$.

Computation---End Areas with Prismoidal Correction.

28. **Three-level Ground.**—

Sta.	Center.	Left.	Right.
0	7.1	6.4 / 14.4	8.0 / 16.0
1	9.8	7.6 / 15.6	12.4 / 20.4
2	12.4	12.4 / 20.4	10.3 / 18.3
3	8.7	9.8 / 17.8	8.1 / 16.1
4	10.2	11.6 / 19.6	9.8 / 17.8

Roadbed 16 ft., side slopes 1 to 1.

COMPUTATION.

Sta.	Width.	Height, or h. + a.	Yds. by End areas		w — w′.	ht′—ht.	Yards, pris'dl.
0	30.4	15.1	426				
1	36.0	17.8	* 119 594	782	—5.6	+2.7	—5
2	38.7	20.4	731	1087	—2.7	+2.6	—3
3	33.9	16.7	— 525	1018	+4.8	—3.7	—6
4	37.4	18.2	631	918	—3.5	+1.5	—2

Approximate volume = 3805 —16
Prismoidal correction = — 16

True volume = 3789

29. **Irregular Ground.**—

9	6.8		5.2 / 13.2	7.4 / 8	3.4 / 11.4		
10	4.9		9.6 / 17.6	4.1 / 9	3.6 / 11.6		
11	9.0	7.2 / 8 — 5.0 / 12	8.4 / 16.4	5.2 / 7	8.9 / 16.9	10, 14 / 16 | † / 12	
12	6.8	11.4 / 16	12.8 / 20.8		7.1 / 15.1		
13	8.6	7.7 / 12	7.4 / 15.4		5.2 / 13.2		
+47	2.0	4 / 10	5.4 / 13.4		0.0 / 8.0		
+65	0.0	2.1 / 8	3.6 / 11.6		— 1.4 / 9.1		
14	—5.1	0.0 / 4.0	4.2 / 12.2		— 2.0 / 10.0	8 |	
+20	—6.0		0.0 / 8.0		— 4.4 / 13.6		

Roadbed 16 ft., slopes 1 to 1 in cutting.
Roadbed 14 ft., slopes 1½ to 1 in filling.

*119 comes from the grade triangle. It should be subtracted from the yardage for each station.

†The breaks at the left of sta. 11 run out 10 ft. and 14 ft. respectively to the left of 10, etc.

Computation.—*Averaging end areas—Prismoidal correction.*

Sta.	Width.	Height, or h.+a.	Cubic yards. Table.	Cubic yards. Station.	w — w′.	ht′— ht.	Yards, pris'dl.
9	13.2	14.8	182				
	11.4	15.4	163				
	8	3.4	25				
			370				
10	17.6	12.9	211		—4.4	—1.9	+2
Pris'l* for 11	17.6	16.6					
	14	—2.0					
	10	—3 7					
	11.6	12.1	130		—0 2	—3.3	
	9	1.3	11	484	—1.0	—2.1	+1
			352				
11	16.4	13.0	198		+1.2	—3.6	—1
	12	—1.2	—13		+2.0	+0.8	
	8	+4.0	30		+2.0	+7.7	+4
	16.9	13 2	207		—5 3	+1.1	—2
	7	+0.1	1	537	+2.0	—1.2	—1
			423				
12	20.8	19.4	374		—4.4	+6.4	—8
	16	—6.0	—89				
Pris'l* for 11	16	—1.4			—4.0	—0.2	
	16	—4.6			—8.0	—8.6	+21
	15.1	14.8	206				
Pris'l for 11	15.1	15.0			+1.8	+1.8	+ 1
	12	—0.3	491	676	—5.0	—0 4	+ 1
13	15.4	15.7	224		+5.4	—3.7	— 6
	12	1.2	13		+4.0	+7.2	+ 9
	13.2	16.6	203	693	+1.9	+1.8	+ 1
			440				
+47	13.4	12.0	148		+2.0	—3.7	— 1
	10	—3.4	—32		+2.0	—4.6	— 1
	8	10.0	74	184	+5.2	—6.6	— 5
			190				
+65	11.6	10.1	109		1.8	—1.9	
	8	—3.6	—26		2.0	—0.2	
	8	8	59	17			
			142				
14	12.2	8 0	90		— .6	+2.1	
	4	—4.2	—16		4.0	+0.6	
	8	8.0	59	13			
			133				
+20	8	8.0	59		+4.2	0.0	
	8	0.0			—4.0	+4.2	— 1
	8	8.0	60	3	0.0	0.0	
			119				

Grade triangle — 119

*These can usually be avoided in practice by placing the same number of breaks in adjacent sections as already indicated in § 21.

Approx. volume	+ 2607	+ 40
Prisml. Cor. =	+ 14	— 26
True volume___ =	2621	

30. **Rules for Cross Sectioning.**—In deriving the prismoidal formula, the ground surface of each prismoid was assumed to be a hyperbolic paraboloid. Hence if the prismoidal formula, or its equivalent, is to be used:

Place cross sections at the regular stations (usually 100 feet apart), treating the ground as three-level if the surface is very regular; five-level if at all broken, as the increased labor in field and office is slight; and irregular if more broken. The object being to obtain points enough in each cross section so that *straight lines joining them will lie in the surface, or will equalize the surface,* and to adopt the method which will secure this at most of the sections without extra breaks, even if it gives more points than are necessary at some of the more regular stations.

The excess or deficiency of detatched boulders, ditches, small ravines, etc., as compared with the regular surface, can often be estimated more satisfactorily than to attempt to include them in the cross sections.

It should also be noted that the formula requires the same number of sides or points in adjacent cross sections (dividing the solid into triangular prismoids), requiring that when a ridge or hollow runs out its vanishing point in the more regular section be taken and the section be made up with the break for the solid on one side and without it for the solid on the other side of the section. The height of this vanishing point can be computed, but it is usually better to measure it in the field.

Intermediate cross sections should be added whenever straight lines joining corresponding points of the regular sections will not lie in the surface or equalize the surface, and enough should be added to fulfill this condition. When the center line is curved, the lines joining corresponding points of adjacent cross sections should be estimated at the same curvature in judging of their coincidence with the ground surface.

A cross section should also be placed wherever a grade point occurs on either edge of the roadbed (usually limited to the edges in cutting) or center line. In light work and where the transverse slope is small, a section is sometimes taken where the center line comes to grade and the other two sections omitted. See § 16.

The plus stations are preferably placed at 50 feet, at multiples of 10, or at whole feet (except grade points) from the last full station, for convenience of computing grades in the field and quantities in the office. Breaks on a cross section should be put at multiples of ten, or at whole feet, from the center, when possible without a sacrifice of accuracy.

When the method by averaging end areas is used, without the prismoidal correction, additional sections should be taken whenever the change in transverse slope or in area between adjacent sections is great. The reason for this can be seen by referring to (2); halving the distance between sections will halve both factors (w'—w) and (c—c') or quarter the product, so that when the two half length solids are added together the correction or error will be reduced one-half. The error due to averaging end areas can thus be made as small as desirable, but the method if extended far would soon involve more extra labor than to apply the prismoidal correction.

The same remarks will apply to the method by middle areas.

31. **Preliminary Estimates.**—Tables of cubic yards per 100 feet are much used for preliminary estimates. As given in the field books they cover the usual widths of roadbed for single and double track and the usual side slopes. The argument is the center cut or fill for ground level transversely.

The effect of a transverse slope in increasing the yardage is frequently not appreciated and allowed for especially as it requires considerable extra labor if done without suitable tables.

On this account it has seemed desirable to extend the tables for the ordinary widths of single and double track roadbed to include transverse slopes and to give the formula in convenient form for extension to other roadbeds and side slopes. These tables have been computed for side slopes of 1 to 1 and of 1½ to 1.

Denote the angle of transverse slope by A, assumed positive to the right, and the side slope by s.

Then (see Fig. 11) for the distance to the slope stakes

$$f_r = \frac{a+c}{1/s - \tan A}$$

$$f_l = \frac{a+c}{1/s + \tan A}$$

$$w = f_r + f_l = \frac{a+c}{1/s^2 - \tan^2 A}\ \frac{2}{s}$$

$$\text{Area} = \frac{a+c}{2}\, w - \frac{a\,b}{2}$$

Volume in cu. yds.

$$V = \frac{100\,(a+c)^2}{27s\,(1/s^2 - \tan^2 A)} - \frac{100\,a\,b}{54} \qquad (20)$$

For level ground this reduces to

$$V' = \frac{100\,(a+c)^2 s}{27} - \frac{100\,a\,b}{54} \qquad (21)$$

The transverse slope is readily measured with a hand level or slope level, or it may be estimated closely enough for preliminary estimates of yardage.

The quantities can be taken from the table for the proper slope as readily as for a level slope.

If a yardage scale is used for taking quantities from the profile, the transverse slopes can be allowed for by drawing lines parallel to the edge of the scale at a convenient distance apart and marking each with a transverse slope angle extending back from zero at the edge. The yardage lines are then extended back so as to cut each slope line at the center height corresponding to the yardage. The scale should be on tracing cloth or celluloid so that the cubic yards for each height can be read on its corresponding transverse slope vertical.

TABLE

OF

TRIANGULAR PRISMOIDS FOR RAILWAY EARTHWORK

IN CUBIC YARDS

BY AVERAGING END AREAS

(See Prismoidal Correction)

Corrections for tenths of height.

.1	.2	.3	.4	.5	.6	.7	.8	.9	WIDTH.	1	2	3	4	5	6	7	8	9	10
					1	1	1	1	**1**	1	2	3	4	5	6	6	7	8	9
		1	1	1	1	1	1	2	**2**	2	4	6	7	9	11	13	15	17	19
	1	1	1	1	2	2	2	3	**3**	3	6	8	11	14	17	19	22	25	28
	1	1	1	2	2	3	3	3	**4**	4	7	11	15	19	22	26	30	33	37
	1	1	2	2	3	3	4	4	**5**	5	9	14	19	23	28	32	37	42	46
1	1	2	2	3	3	4	4	5	**6**	6	11	17	22	28	33	39	44	50	56
1	1	2	3	3	4	5	5	6	**7**	6	13	19	26	32	39	45	52	58	65
1	1	2	3	4	4	5	6	7	**8**	7	15	22	30	37	44	52	59	67	74
1	2	3	3	4	5	6	7	8	**9**	8	17	25	33	42	50	58	67	75	83
1	2	3	4	5	6	6	7	8	**10**	9	19	28	37	46	56	65	74	83	93
1	2	3	4	5	6	7	8	9	**11**	10	20	31	41	51	61	71	81	92	102
1	2	3	4	6	7	8	9	10	**12**	11	22	33	44	56	67	78	89	100	111
1	2	4	5	6	7	8	10	11	**13**	12	24	36	48	60	72	84	96	108	120
1	3	4	5	6	8	9	10	12	**14**	13	26	39	52	65	78	91	104	117	130
1	3	4	6	7	8	10	11	13	**15**	14	28	42	56	69	83	97	111	125	139
1	3	4	6	7	9	10	12	13	**16**	15	30	44	59	74	89	104	119	133	148
2	3	5	6	8	9	11	13	14	**17**	16	31	47	63	79	94	110	126	142	157
2	3	5	7	8	10	12	13	15	**18**	17	33	50	67	83	100	117	133	150	167
2	4	5	7	9	11	12	14	16	**19**	18	35	53	70	88	106	123	141	158	176
2	4	6	7	9	11	13	15	17	**20**	19	37	56	74	93	111	130	148	167	185
2	4	6	8	10	12	14	16	18	**21**	19	39	58	78	97	117	136	156	175	194
2	4	6	8	10	12	14	16	18	**22**	20	41	61	81	102	122	143	163	183	204
2	4	6	9	11	13	15	17	19	**23**	21	43	64	85	106	128	149	170	192	213
2	4	7	9	11	13	16	18	20	**24**	22	44	67	89	111	133	156	178	200	222
2	5	7	9	12	14	16	19	21	**25**	23	46	69	93	116	139	162	185	208	231
2	5	7	10	12	14	17	19	22	**26**	24	48	72	96	120	144	169	193	217	241
3	5	8	10	13	15	18	20	23	**27**	25	50	75	100	125	150	175	200	225	250
3	5	8	10	13	16	18	21	23	**28**	26	52	78	104	130	156	181	207	233	259
3	5	8	11	13	16	19	21	24	**29**	27	54	81	107	134	161	188	215	242	269
3	6	8	11	14	17	19	22	25	**30**	28	56	83	111	139	167	194	222	250	278
3	6	9	11	14	17	20	23	26	**31**	29	57	86	115	144	172	201	230	258	287
3	6	9	12	15	18	21	24	27	**32**	30	59	89	119	148	178	207	237	267	296
3	6	9	12	15	18	21	24	28	**33**	31	61	92	122	153	183	214	244	275	306
3	6	9	13	16	19	22	25	28	**34**	31	63	94	126	157	189	220	252	283	315
3	6	10	13	16	19	23	26	29	**35**	32	65	97	130	162	194	227	259	292	324
3	7	10	13	17	20	23	27	30	**36**	33	67	100	133	167	200	233	267	300	333
3	7	10	14	17	21	24	27	31	**37**	34	69	103	137	171	206	240	274	308	343
4	7	11	14	18	21	25	28	32	**38**	35	70	106	141	176	211	246	281	317	352
4	7	11	14	18	22	25	29	33	**39**	36	72	108	144	181	217	253	289	325	361
4	7	11	15	19	22	26	30	33	**40**	37	74	111	148	185	222	259	296	333	370
4	8	11	15	19	23	27	30	34	**41**	38	76	114	152	190	228	266	304	342	380
4	8	12	16	19	23	27	31	35	**42**	39	78	117	156	194	233	272	311	350	389
4	8	12	16	20	24	28	32	36	**43**	40	80	119	159	199	239	279	319	358	398
4	8	12	16	20	24	29	33	37	**44**	41	81	122	163	204	244	285	326	367	407
4	8	13	17	21	25	29	33	38	**45**	42	83	125	167	208	250	292	333	375	417
4	9	13	17	21	26	30	34	38	**46**	43	85	128	170	213	256	298	341	383	426
4	9	13	17	22	26	30	35	39	**47**	44	87	131	174	218	261	305	348	392	435
4	9	13	18	22	27	31	36	40	**48**	44	89	133	178	222	267	311	356	400	444
5	9	14	18	23	27	32	36	41	**49**	45	91	136	181	227	272	318	363	408	454
5	9	14	19	23	28	32	37	42	**50**	46	93	139	185	231	278	324	370	417	463
.1	.2	.3	.4	.5	.6	.7	.8	.9		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**

Corrections for tenths of width.

0.1						1	1	1	1	1
0.2			1	1	1	1	1	1	2	2
0.3		1	1	1	1	2	2	2	3	3
0.4		1	1	1	2	2	3	3	3	4
0.5		1	1	2	2	3	3	4	4	5
0.6	1	1	2	2	3	3	4	4	5	6
0.7	1	1	2	3	3	4	5	5	6	6
0.8	1	1	2	3	4	4	5	6	7	7
0.9	1	2	3	3	4	5	6	7	8	8

Corrections for tenths of height.

.1	.2	.3	.4	.5	.6	.7	.8	.9	WIDTH.	1	2	3	4	5	6	7	8	9	10
5	9	14	19	24	28	33	38	43	**51**	47	94	142	189	236	283	331	378	425	472
5	10	14	19	24	29	34	39	43	**52**	48	96	144	193	241	289	337	385	433	481
5	10	15	20	25	29	34	39	44	**53**	49	98	147	196	245	294	344	393	442	491
5	10	15	20	25	30	35	40	45	**54**	50	100	150	200	250	300	350	400	450	500
5	10	15	20	25	31	36	41	46	**55**	51	102	153	204	255	306	356	407	458	509
5	10	16	21	26	31	36	41	47	**56**	52	104	156	207	259	311	363	415	467	519
5	11	16	21	26	32	37	42	48	**57**	53	106	158	211	264	317	369	422	475	528
5	11	16	21	27	32	38	43	48	**58**	54	107	161	215	269	322	376	430	483	537
5	11	16	22	27	33	38	44	49	**59**	55	109	164	219	273	328	382	437	492	546
6	11	17	22	28	33	39	44	50	**60**	56	111	167	222	278	333	389	444	500	556
6	11	17	23	28	34	40	45	51	**61**	56	113	169	226	282	339	395	452	508	565
6	11	17	23	29	34	40	46	52	**62**	57	115	172	230	287	344	402	459	517	574
6	12	18	23	29	35	41	47	53	**63**	58	117	175	233	292	350	408	467	525	583
6	12	18	24	30	36	41	47	53	**64**	59	119	178	237	296	356	415	474	533	593
6	12	18	24	30	36	42	48	54	**65**	60	120	181	241	301	361	421	481	542	602
6	12	18	24	31	37	43	49	55	**66**	61	122	183	244	306	367	428	489	550	611
6	12	19	25	31	37	43	50	56	**67**	62	124	186	248	310	372	434	496	558	620
6	13	19	25	31	38	44	50	57	**68**	63	126	189	252	315	378	441	504	567	630
6	13	19	26	32	38	45	51	58	**69**	64	128	192	256	319	383	447	511	575	639
6	13	19	26	32	39	45	52	58	**70**	65	130	194	259	324	389	454	519	583	648
7	13	20	26	33	39	46	53	59	**71**	66	131	197	263	329	394	460	526	592	657
7	13	20	27	33	40	47	53	60	**72**	67	133	200	267	333	400	467	533	600	667
7	14	20	27	34	41	47	54	61	**73**	68	135	203	270	338	406	473	541	608	676
7	14	21	27	34	41	48	55	62	**74**	69	137	206	274	343	411	480	548	617	685
7	14	21	28	35	42	49	56	63	**75**	69	139	208	278	347	417	486	556	625	694
7	14	21	28	35	42	49	56	63	**76**	70	141	211	281	352	422	493	563	633	704
7	14	21	29	36	43	50	57	64	**77**	71	143	214	285	356	428	499	570	642	713
7	14	22	29	36	43	51	58	65	**78**	72	144	217	289	361	433	506	578	650	722
7	15	22	29	37	44	51	59	66	**79**	73	146	219	293	366	439	512	585	658	731
7	15	22	30	37	44	52	59	67	**80**	74	148	222	296	370	444	519	593	667	741
8	15	23	30	38	45	53	60	68	**81**	75	150	225	300	375	450	525	600	675	750
8	15	23	30	38	46	53	61	68	**82**	76	152	228	304	380	456	531	607	683	759
8	15	23	31	38	46	54	61	69	**83**	77	154	231	307	384	461	538	615	692	769
8	16	23	31	39	47	54	62	70	**84**	78	156	233	311	389	467	544	622	700	778
8	16	24	31	39	47	55	63	71	**85**	79	157	236	315	394	472	551	630	708	787
8	16	24	32	40	48	56	64	72	**86**	80	159	239	319	398	478	557	637	717	796
8	16	24	32	40	48	56	64	73	**87**	81	161	242	322	403	483	564	644	725	806
8	16	24	33	41	49	57	65	73	**88**	81	163	244	326	407	489	570	652	733	815
8	16	25	33	41	49	58	66	74	**89**	82	165	247	330	412	494	577	659	742	824
8	17	25	33	42	50	58	67	75	**90**	83	167	250	333	417	500	583	667	750	833
8	17	25	34	42	51	59	67	76	**91**	84	169	253	337	421	506	590	674	758	843
9	17	26	34	43	51	60	68	77	**92**	85	170	256	341	426	511	596	681	767	852
9	17	26	34	43	52	60	69	78	**93**	86	172	258	344	431	517	603	689	775	861
9	17	26	35	44	52	61	70	78	**94**	87	174	261	348	435	522	609	696	783	870
9	18	26	35	44	53	62	70	79	**95**	88	176	264	352	440	528	616	704	792	880
9	18	27	36	44	53	62	71	80	**96**	89	178	267	356	444	533	622	711	800	889
9	18	27	36	45	54	63	72	81	**97**	90	180	269	359	449	539	629	719	808	898
9	18	27	36	45	54	64	73	82	**98**	91	181	272	363	454	544	635	726	817	907
9	18	28	37	46	55	64	73	83	**99**	92	183	275	367	458	550	642	733	825	917
9	19	28	37	46	56	65	74	83	**100**	93	185	278	370	563	556	648	741	833	926
.1	.2	.3	.4	.5	.6	.7	.8	.9		1	2	3	4	5	6	7	8	9	10

Corrections for tenths of width.

	1	2	3	4	5	6	7	8	9	10
0.1						1	1	1	1	1
0.2			1	1	1	1	1	1	2	2
0.3		1	1	1	1	2	2	2	3	3
0.4		1	1	1	2	2	3	3	3	4
0.5		1	1	2	2	3	3	4	4	5
0.6	1	1	2	2	3	3	4	4	5	6
0.7	1	1	2	3	3	4	5	5	6	6
0.8	1	1	2	3	4	4	5	6	7	7
0.9	1	2	3	3	4	5	6	7	8	8

Corrections for tenths of height.

.1	.2	.3	.4	.5	.6	.7	.8	.9	WIDTH	11	12	13	14	15	16	17	18	19	20
					1	1	1	1	**1**	10	11	12	13	14	15	16	17	18	19
		1	1	1	1	1	1	2	**2**	20	22	24	26	28	30	31	33	35	37
	1	1	1	1	2	2	2	3	**3**	31	33	36	39	42	44	47	50	53	56
	1	1	1	2	2	3	3	3	**4**	41	44	48	52	56	59	63	67	70	74
	1	1	2	2	3	3	4	4	**5**	51	56	60	65	69	74	79	83	88	93
1	1	2	2	3	3	4	4	5	**6**	61	67	72	78	83	89	94	100	106	111
1	1	2	3	3	4	5	5	6	**7**	71	78	84	91	97	104	110	117	123	130
1	1	2	3	4	4	5	6	7	**8**	81	89	96	104	111	119	126	133	141	148
1	2	3	3	4	5	6	7	8	**9**	92	100	108	117	125	133	142	150	158	167
1	2	3	4	5	6	6	7	8	**10**	102	111	120	130	139	148	157	167	176	185
1	2	3	4	5	6	7	8	9	**11**	112	122	132	143	153	163	173	183	194	204
1	2	3	4	6	7	8	9	10	**12**	122	133	144	156	167	178	189	200	211	222
1	2	4	5	6	7	8	10	11	**13**	132	144	156	169	181	193	205	217	229	241
1	3	4	5	6	8	9	10	12	**14**	143	156	169	181	194	207	220	233	246	259
1	3	4	6	7	8	10	11	13	**15**	153	167	181	194	208	222	236	250	264	278
1	3	4	6	7	9	10	12	13	**16**	163	178	193	207	222	237	252	267	281	296
2	3	5	6	8	9	11	13	14	**17**	173	189	205	220	236	252	268	283	299	315
2	3	5	7	8	10	12	13	15	**18**	183	200	217	233	250	267	283	300	317	333
2	4	5	7	9	11	12	14	16	**19**	194	211	229	246	264	281	299	317	334	352
2	4	6	7	9	11	13	15	17	**20**	204	222	241	259	278	296	315	333	352	370
2	4	6	8	10	12	14	16	18	**21**	214	233	253	272	292	311	331	350	369	389
2	4	6	8	10	12	14	16	18	**22**	224	244	265	285	306	326	346	367	387	407
2	4	6	9	11	13	15	17	19	**23**	234	256	277	298	319	341	362	383	405	426
2	4	7	9	11	13	16	18	20	**24**	244	267	289	311	333	356	378	400	422	444
2	5	7	9	12	14	16	19	21	**25**	255	278	301	324	347	370	394	417	440	463
2	5	7	10	12	14	17	19	22	**26**	265	289	313	337	361	385	409	433	457	481
3	5	8	10	13	15	18	20	23	**27**	275	300	325	350	375	400	425	450	475	500
3	5	8	10	13	16	18	21	23	**28**	285	311	337	363	389	415	441	467	493	519
3	5	8	11	13	16	19	21	24	**29**	295	322	349	376	403	430	456	483	510	537
3	6	8	11	14	17	19	22	25	**30**	306	333	361	389	417	444	472	500	528	556
3	6	9	11	14	17	20	23	26	**31**	316	344	373	402	431	459	488	517	545	574
3	6	9	12	15	18	21	24	27	**32**	326	356	385	415	444	474	504	533	563	593
3	6	9	12	15	18	21	24	28	**33**	336	367	397	428	458	489	519	550	581	611
3	6	9	13	16	19	22	25	28	**34**	346	378	409	441	472	504	535	567	598	630
3	6	10	13	16	19	23	26	29	**35**	356	389	421	454	486	519	551	583	616	648
3	7	10	13	17	20	23	27	30	**36**	367	400	433	467	500	533	567	600	633	667
3	7	10	14	17	21	24	27	31	**37**	377	411	445	480	514	548	582	617	651	685
4	7	11	14	18	21	25	28	32	**38**	387	422	457	493	528	563	598	633	669	704
4	7	11	14	18	22	25	29	33	**39**	397	433	469	506	542	578	614	650	686	722
4	7	11	15	19	22	26	30	33	**40**	407	444	481	519	556	593	630	667	704	741
4	8	11	15	19	23	27	30	34	**41**	418	456	494	531	569	607	645	683	721	759
4	8	12	16	19	23	27	31	35	**42**	428	467	506	544	583	622	661	700	739	778
4	8	12	16	20	24	28	32	36	**43**	438	478	518	557	597	637	677	717	756	796
4	8	12	16	20	24	29	33	37	**44**	448	489	530	570	611	652	693	733	774	815
4	8	13	17	21	25	29	33	38	**45**	458	500	542	583	625	667	708	750	792	833
4	9	13	17	21	26	30	34	38	**46**	469	511	554	596	639	681	724	767	809	852
4	9	13	17	22	26	30	35	39	**47**	479	522	566	609	653	696	740	783	827	870
4	9	13	18	22	27	31	36	40	**48**	489	533	578	622	667	711	756	800	844	889
5	9	14	18	23	27	32	36	41	**49**	499	544	590	635	681	726	771	817	862	907
5	9	14	19	23	28	32	37	42	**50**	509	556	602	648	694	741	787	833	880	926
.1	.2	.3	.4	.5	.6	.7	.8	.9		11	12	13	14	15	16	17	18	19	20

Corrections for tenths of width.										
0.1	1	1	1	1	1	1	2	2	2	2
0.2	2	2	2	3	3	3	3	3	4	4
0.3	3	3	4	4	4	4	5	5	5	6
0.4	4	4	5	5	6	6	6	7	7	7
0.5	5	6	6	6	7	7	8	8	9	9
0.6	6	7	7	8	8	9	9	10	11	11
0.7	7	8	8	9	10	10	11	12	12	13
0.8	8	9	10	10	11	12	13	13	14	15
0.9	9	10	11	12	13	13	14	15	16	17

Corrections for tenths of height.

.1	.2	.3	.4	.5	.6	.7	.8	.9	WIDTH	11	12	13	14	15	16	17	18	19	20
5	9	14	19	24	28	33	38	43	**51**	519	567	614	661	708	756	803	850	897	944
5	10	14	19	24	29	34	39	43	**52**	530	578	626	674	722	770	819	867	915	963
5	10	15	20	25	29	34	39	44	**53**	540	589	638	687	736	785	834	883	932	981
5	10	15	20	25	30	35	40	45	**54**	550	600	650	700	750	800	850	900	950	1000
5	10	15	20	25	31	36	41	46	**55**	560	611	662	713	764	815	866	917	968	1019
5	10	16	21	26	31	36	41	47	**56**	570	622	674	726	778	830	881	933	985	1037
5	11	16	21	26	32	37	42	48	**57**	581	633	686	739	792	844	897	950	1003	1056
5	11	16	21	27	32	38	43	48	**58**	591	644	698	752	806	859	913	967	1020	1074
5	11	16	22	27	33	38	44	49	**59**	601	656	710	765	819	874	929	983	1038	1093
6	11	17	22	28	33	39	44	50	**60**	611	667	722	778	833	889	944	1000	1056	1111
6	11	17	23	28	34	40	45	51	**61**	621	678	734	791	847	904	960	1017	1073	1130
6	11	17	23	29	34	40	46	52	**62**	631	689	746	804	861	919	976	1033	1091	1148
6	12	18	23	29	35	41	47	53	**63**	642	700	758	817	875	933	992	1050	1108	1167
6	12	18	24	30	36	41	47	53	**64**	652	711	770	830	889	948	1007	1067	1126	1185
6	12	18	24	30	36	42	48	54	**65**	662	722	782	843	903	963	1023	1083	1144	1204
6	12	18	24	31	37	43	49	55	**66**	672	733	794	856	917	978	1039	1100	1161	1222
6	12	19	25	31	37	43	50	56	**67**	682	744	806	869	931	993	1055	1117	1179	1241
6	13	19	25	31	38	44	50	57	**68**	693	756	819	881	944	1007	1070	1133	1196	1259
6	13	19	26	32	38	45	51	58	**69**	703	767	831	894	958	1022	1086	1150	1214	1278
6	13	19	26	32	39	45	52	58	**70**	713	778	843	907	972	1037	1102	1167	1231	1296
7	13	20	26	33	39	46	53	59	**71**	723	789	855	920	986	1052	1118	1183	1249	1315
7	13	20	27	33	40	47	53	60	**72**	733	800	867	933	1000	1067	1133	1200	1267	1333
7	14	20	27	34	41	47	54	61	**73**	744	811	879	946	1014	1081	1149	1217	1284	1352
7	14	21	27	34	41	48	55	62	**74**	754	822	891	959	1028	1096	1165	1233	1302	1370
7	14	21	28	35	42	49	56	63	**75**	764	833	903	972	1042	1111	1181	1250	1319	1389
7	14	21	28	35	42	49	56	63	**76**	774	844	915	985	1056	1126	1196	1267	1337	1407
7	14	21	29	36	43	50	57	64	**77**	784	856	927	998	1069	1141	1212	1283	1355	1426
7	14	22	29	36	43	51	58	65	**78**	794	867	939	1011	1083	1156	1228	1300	1372	1444
7	15	22	29	37	44	51	59	66	**79**	805	878	951	1024	1097	1170	1244	1317	1390	1463
7	15	22	30	37	44	52	59	67	**80**	815	889	963	1037	1111	1185	1259	1333	1407	1481
8	15	23	30	38	45	53	60	68	**81**	825	900	975	1050	1125	1200	1275	1350	1425	1500
8	15	23	30	38	46	53	61	68	**82**	835	911	987	1063	1139	1215	1291	1367	1443	1519
8	15	23	31	38	46	54	61	69	**83**	845	922	999	1076	1153	1230	1306	1383	1460	1537
8	16	23	31	39	47	54	62	70	**84**	856	933	1011	1089	1167	1244	1322	1400	1478	1556
8	16	24	31	39	47	55	63	71	**85**	866	944	1023	1102	1181	1259	1338	1417	1495	1574
8	16	24	32	40	48	56	64	72	**86**	876	956	1035	1115	1194	1274	1354	1433	1513	1593
8	16	24	32	40	48	56	64	73	**87**	886	967	1047	1128	1208	1289	1369	1450	1531	1611
8	16	24	33	41	49	57	65	73	**88**	896	978	1059	1141	1222	1304	1385	1467	1548	1630
8	16	25	33	41	49	58	66	74	**89**	906	989	1071	1154	1236	1319	1401	1483	1566	1648
8	17	25	33	42	50	58	67	75	**90**	917	1000	1083	1167	1250	1333	1417	1500	1583	1667
8	17	25	34	42	51	59	67	76	**91**	927	1011	1095	1180	1264	1348	1432	1517	1601	1685
9	17	26	34	43	51	60	68	77	**92**	937	1022	1107	1193	1278	1363	1448	1533	1619	1704
9	17	26	34	43	52	60	69	78	**93**	947	1033	1119	1206	1292	1378	1464	1550	1636	1722
9	17	26	35	44	52	61	70	78	**94**	957	1044	1131	1219	1306	1393	1480	1567	1654	1741
9	18	26	35	44	53	62	70	79	**95**	968	1056	1144	1231	1319	1407	1495	1583	1671	1759
9	18	27	36	44	53	62	71	80	**96**	978	1067	1156	1244	1333	1422	1511	1600	1689	1778
9	18	27	36	45	54	63	72	81	**97**	988	1078	1168	1257	1347	1437	1527	1617	1706	1796
9	18	27	36	45	54	64	73	82	**98**	998	1089	1180	1270	1361	1452	1543	1633	1724	1815
9	18	28	37	46	55	64	73	83	**99**	1008	1100	1192	1283	1375	1467	1558	1650	1742	1833
9	19	28	37	46	56	65	74	83	**100**	1019	1111	1204	1296	1389	1481	1574	1667	1759	1852
.1	.2	.3	.4	.5	.6	.7	.8	.9		11	12	13	14	15	16	17	18	19	20

Corrections for tenths of width.										
0.1	1	1	1	1	1	1	2	2	2	2
0.2	2	2	2	3	3	3	3	3	4	4
0.3	3	3	4	4	4	4	5	5	5	6
0.4	4	4	5	5	6	6	6	7	7	7
0.5	5	6	6	6	7	7	8	8	9	9
0.6	6	7	7	8	8	9	9	10	11	11
0.7	7	8	8	9	10	10	11	12	12	13
0.8	8	9	10	10	11	12	13	13	14	15
0.9	9	10	11	12	13	13	14	15	16	17

Corrections for tenths of height.

.1	.2	.3	.4	.5	.6	.7	.8	.9	WIDTH	21	22	23	24	25	26	27	28	29	30
					1	1	1	1	1	19	20	21	22	23	24	25	26	27	28
		1	1	1	1	1	1	2	2	39	41	43	44	46	48	50	52	54	56
	1	1	1	1	2	2	2	3	3	58	61	64	67	69	72	75	78	81	83
	1	1	1	2	2	3	3	3	4	78	81	85	89	93	96	100	104	107	111
	1	1	2	2	3	3	4	4	5	97	102	106	111	116	120	125	130	134	139
1	1	2	2	3	3	4	4	5	6	117	122	128	133	139	144	150	156	161	167
1	1	2	3	3	4	5	5	6	7	136	143	149	156	162	169	175	181	188	194
1	1	2	3	4	4	5	6	7	8	156	163	170	178	185	193	200	207	215	222
1	2	3	3	4	5	6	7	8	9	175	183	192	200	208	217	225	233	242	250
1	2	3	4	5	6	6	7	8	10	194	204	213	222	231	241	250	259	269	278
1	2	3	4	5	6	7	8	9	11	214	224	234	244	255	265	275	285	295	306
1	2	3	4	6	7	8	9	10	12	233	244	256	267	278	289	300	311	322	333
1	2	4	5	6	7	8	10	11	13	253	265	277	289	301	313	325	337	349	361
1	3	4	5	6	8	9	10	12	14	272	285	298	311	324	337	350	363	376	389
1	3	4	6	7	8	10	11	13	15	292	306	319	333	347	361	375	389	403	417
1	3	4	6	7	9	10	12	13	16	311	326	341	356	370	385	400	415	430	444
2	3	5	6	8	9	11	13	14	17	331	346	362	378	394	409	425	441	456	472
2	3	5	7	8	10	12	13	15	18	350	367	383	400	417	433	450	467	483	500
2	4	5	7	9	11	12	14	16	19	369	387	405	422	440	457	475	493	510	528
2	4	6	7	9	11	13	15	17	20	389	407	426	444	463	481	500	519	537	556
2	4	6	8	10	12	14	16	18	21	408	428	447	467	486	506	525	544	564	583
2	4	6	8	10	12	14	16	18	22	428	448	469	489	509	530	550	570	591	611
2	4	6	9	11	13	15	17	19	23	447	469	490	511	532	554	575	596	618	639
2	4	7	9	11	13	16	18	20	24	467	489	511	533	556	578	600	622	644	667
2	5	7	9	12	14	16	19	21	25	486	509	532	556	579	602	625	648	671	694
2	5	7	10	12	14	17	19	22	26	506	530	554	578	602	626	650	674	698	722
3	5	8	10	13	15	18	20	23	27	525	550	575	600	625	650	675	700	725	750
3	5	8	10	13	16	18	21	23	28	544	570	596	622	648	674	700	726	752	778
3	5	8	11	13	16	19	21	24	29	564	591	618	644	671	698	725	752	779	806
3	6	8	11	14	17	19	22	25	30	583	611	639	667	694	722	750	778	806	833
3	6	9	11	14	17	20	23	26	31	603	631	660	689	718	746	775	804	832	861
3	6	9	12	15	18	21	24	27	32	622	652	681	711	741	770	800	830	859	889
3	6	9	12	15	18	21	24	28	33	642	672	703	733	764	794	825	856	886	917
3	6	9	13	16	19	22	25	28	34	661	693	724	756	787	819	850	881	913	944
3	6	10	13	16	19	23	26	29	35	681	713	745	778	810	843	875	907	940	972
3	7	10	13	17	20	23	27	30	36	700	733	767	800	833	867	900	933	967	1000
3	7	10	14	17	21	24	27	31	37	719	754	788	822	856	891	925	959	994	1028
4	7	11	14	18	21	25	28	32	38	739	774	809	844	880	915	950	985	1020	1056
4	7	11	14	18	22	25	29	33	39	758	794	831	867	903	939	975	1011	1047	1083
4	7	11	15	19	22	26	30	33	40	778	815	852	889	926	963	1000	1037	1074	1111
4	8	11	15	19	23	27	30	34	41	797	835	873	911	949	987	1025	1063	1101	1139
4	8	12	16	19	23	27	31	35	42	817	856	894	933	972	1011	1050	1089	1128	1167
4	8	12	16	20	24	28	32	36	43	836	876	916	956	995	1035	1075	1115	1155	1194
4	8	12	16	20	24	29	33	37	44	856	896	937	978	1019	1059	1100	1141	1181	1222
4	8	13	17	21	25	29	33	38	45	875	917	958	1000	1042	1083	1125	1167	1208	1250
4	9	13	17	21	26	30	34	38	46	894	937	980	1022	1065	1107	1150	1193	1235	1278
4	9	13	17	22	26	30	35	39	47	914	957	1001	1044	1088	1131	1175	1219	1262	1306
4	9	13	18	22	27	31	36	40	48	933	978	1022	1067	1111	1156	1200	1244	1289	1333
5	9	14	18	23	27	32	36	41	49	953	998	1044	1088	1134	1180	1225	1270	1316	1361
5	9	14	19	23	28	32	37	42	50	972	1019	1065	1111	1157	1204	1250	1296	1343	1389
.1	.2	.3	.4	.5	.6	.7	.8	.9		21	22	23	24	25	26	27	28	29	30

Corrections for tenths of width										
0.1	2	2	2	2	2	2	3	3	3	3
0.2	4	4	4	4	5	5	5	5	5	6
0.3	6	6	6	7	7	7	8	8	8	8
0.4	8	8	9	9	9	10	10	10	11	11
0.5	10	10	11	11	12	12	13	13	13	14
0.6	12	12	13	13	14	14	15	16	16	17
0.7	14	14	15	16	16	17	18	18	19	19
0.8	16	16	17	18	19	19	20	21	21	22
0.9	18	18	19	20	21	22	23	23	24	25

Corrections for tenths of height.

.1	.2	.3	.4	.5	.6	.7	.8	.9	WIDTH	21	22	23	24	25	26	27	28	29	
5	9	14	19	24	28	33	38	43	**51**	992	1039	1086	1133	1181	1228	1275	1322	1369	1417
5	10	14	19	24	29	34	39	43	**52**	1011	1059	1107	1156	1204	1252	1300	1348	1396	1444
5	10	15	20	25	29	34	39	44	**53**	1031	1080	1129	1178	1227	1276	1325	1374	1423	1472
5	10	15	20	25	30	35	40	45	**54**	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500
5	10	15	20	25	31	36	41	46	**55**	1069	1120	1171	1222	1273	1324	1375	1426	1477	1528
5	10	16	21	26	31	36	41	47	**56**	1089	1141	1193	1244	1296	1348	1400	1452	1504	1556
5	11	16	21	26	32	37	42	48	**57**	1108	1161	1214	1267	1319	1372	1425	1478	1531	1583
5	11	16	21	27	32	38	43	48	**58**	1128	1181	1235	1289	1343	1396	1450	1504	1557	1611
5	11	16	22	27	33	38	44	49	**59**	1147	1202	1256	1311	1366	1420	1475	1530	1584	1639
6	11	17	22	28	33	39	44	50	**60**	1167	1222	1278	1333	1389	1444	1500	1556	1611	1667
6	11	17	23	28	34	40	45	51	**61**	1186	1243	1299	1356	1412	1469	1525	1581	1638	1694
6	11	17	23	29	34	40	46	52	**62**	1206	1263	1320	1378	1435	1493	1550	1607	1665	1722
6	12	18	23	29	35	41	47	53	**63**	1225	1283	1342	1400	1458	1517	1575	1633	1692	1750
6	12	18	24	30	36	41	47	53	**64**	1244	1304	1363	1422	1481	1541	1600	1659	1719	1778
6	12	18	24	30	36	42	48	54	**65**	1264	1324	1384	1444	1505	1565	1625	1685	1745	1806
6	12	18	24	31	37	43	49	55	**66**	1283	1344	1406	1467	1528	1589	1650	1711	1772	1833
6	12	19	25	31	37	43	50	56	**67**	1303	1365	1427	1489	1551	1613	1675	1737	1799	1861
6	13	19	25	31	38	44	50	57	**68**	1322	1385	1448	1511	1574	1637	1700	1763	1826	1889
6	13	19	26	32	38	45	51	58	**69**	1342	1406	1469	1533	1597	1661	1725	1789	1853	1917
6	13	19	26	32	39	45	52	58	**70**	1361	1426	1491	1556	1620	1685	1750	1815	1880	1944
7	13	20	26	33	39	46	53	59	**71**	1381	1446	1512	1578	1644	1709	1775	1841	1906	1972
7	13	20	27	33	40	47	53	60	**72**	1400	1467	1533	1600	1667	1733	1800	1867	1933	2000
7	14	20	27	34	41	47	54	61	**73**	1419	1487	1555	1622	1690	1757	1825	1893	1960	2028
7	14	21	27	34	41	48	55	62	**74**	1439	1507	1576	1644	1713	1781	1850	1919	1987	2056
7	14	21	28	35	42	49	56	63	**75**	1458	1528	1597	1667	1736	1806	1875	1944	2014	2083
7	14	21	28	35	42	49	56	63	**76**	1478	1548	1619	1689	1759	1830	1900	1970	2041	2111
7	14	21	29	36	43	50	57	64	**77**	1497	1569	1640	1711	1782	1854	1925	1996	2068	2139
7	14	22	29	36	43	51	58	65	**78**	1517	1589	1661	1733	1806	1878	1950	2022	2094	2167
7	15	22	29	37	44	51	59	66	**79**	1536	1609	1682	1756	1829	1902	1975	2048	2121	2194
7	15	22	30	37	44	52	59	67	**80**	1556	1630	1704	1778	1852	1926	2000	2074	2148	2222
8	15	23	30	38	45	53	60	68	**81**	1575	1650	1725	1800	1875	1950	2025	2100	2175	2250
8	15	23	30	38	46	53	61	68	**82**	1594	1670	1746	1822	1898	1974	2050	2126	2202	2278
8	15	23	31	38	46	54	61	69	**83**	1614	1691	1768	1844	1921	1998	2075	2152	2229	2306
8	16	23	31	39	47	54	62	70	**84**	1633	1711	1789	1867	1944	2022	2100	2178	2256	2333
8	16	24	31	39	47	55	63	71	**85**	1653	1731	1810	1889	1968	2046	2125	2204	2282	2361
8	16	24	32	40	48	56	64	72	**86**	1672	1752	1831	1911	1991	2070	2150	2230	2309	2389
8	16	24	32	40	48	56	64	73	**87**	1692	1772	1853	1933	2014	2094	2175	2256	2336	2417
8	16	24	33	41	49	57	65	73	**88**	1711	1793	1874	1956	2037	2119	2200	2281	2363	2444
8	16	25	33	41	49	58	66	74	**89**	1731	1813	1895	1978	2060	2143	2225	2307	2390	2472
8	17	25	33	42	50	58	67	75	**90**	1750	1833	1917	2000	2083	2167	2250	2333	2417	2500
8	17	25	34	42	51	59	67	76	**91**	1769	1854	1938	2022	2106	2191	2275	2359	2444	2528
9	17	26	34	43	51	60	68	77	**92**	1789	1874	1959	2044	2130	2215	2300	2385	2470	2556
9	17	26	34	43	52	60	69	78	**93**	1808	1894	1981	2067	2153	2239	2325	2411	2497	2583
9	17	26	35	44	52	61	70	78	**94**	1828	1915	2002	2089	2176	2263	2350	2437	2524	2611
9	18	26	35	44	53	62	70	79	**95**	1847	1935	2023	2111	2199	2287	2375	2463	2551	2639
9	18	27	36	44	53	62	71	80	**96**	1867	1956	2044	2133	2222	2311	2400	2489	2578	2667
9	18	27	36	45	54	63	72	81	**97**	1886	1976	2066	2156	2245	2335	2425	2515	2605	2694
9	18	27	36	45	54	64	73	82	**98**	1906	1996	2087	2178	2269	2359	2450	2541	2631	2722
9	18	28	37	46	55	64	73	83	**99**	1925	2017	2108	2200	2292	2383	2475	2567	2658	2750
9	19	28	37	46	56	65	74	83	**100**	1944	2037	2130	2222	2315	2407	2500	2593	2685	2778
.1	.2	.3	.4	.5	.6	.7	.8	.9		**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**

Corrections for tenths of width.										
0.1	2	2	2	2	2	2	3	3	3	3
0.2	4	4	4	4	5	5	5	5	5	6
0.3	6	6	6	7	7	7	8	8	8	8
0.4	8	8	9	9	9	10	10	10	11	11
0.5	10	10	11	11	12	12	13	13	13	14
0.6	12	12	13	13	14	14	15	16	16	17
0.7	14	14	15	16	16	17	18	18	19	19
0.8	16	16	17	18	19	19	20	21	21	22
0.9	18	18	19	20	21	22	23	23	24	25

Corections for tenths of height.

.1	.2	.3	.4	.5	.6	.7	.8	.9	WIDTH	31	32	33	34	35	36	37	38	39	40
					1	1	1	1	**1**	29	30	31	31	32	33	34	35	36	37
		1	1	1	1	1	1	2	**2**	57	59	61	63	65	67	69	70	72	74
	1	1	1	1	2	2	2	3	**3**	86	89	92	94	97	100	103	106	108	111
	1	1	1	2	2	3	3	3	**4**	115	119	122	126	130	133	137	141	144	148
	1	1	2	2	3	3	4	4	**5**	144	148	153	157	162	167	171	176	181	185
1	1	2	2	3	3	4	4	5	**6**	172	178	183	189	194	200	206	211	217	222
1	1	2	3	3	4	5	5	6	**7**	201	207	214	220	227	233	240	246	253	259
1	1	2	3	4	4	5	6	7	**8**	230	237	244	252	259	267	274	281	289	296
1	2	3	3	4	5	6	7	8	**9**	258	267	275	283	292	300	308	317	325	333
1	2	3	4	5	6	6	7	8	**10**	287	296	306	315	324	333	343	352	361	370
1	2	3	4	5	6	7	8	9	**11**	316	326	336	346	356	367	377	387	397	407
1	2	3	4	6	7	8	9	10	**12**	344	356	367	378	389	400	411	422	433	444
1	2	4	5	6	7	8	10	11	**13**	373	385	397	409	421	433	445	457	469	481
1	3	4	5	6	8	9	10	12	**14**	402	415	428	441	454	467	480	493	506	519
1	3	4	6	7	8	10	11	13	**15**	431	444	458	472	486	500	514	528	542	556
1	3	4	6	7	9	10	12	13	**16**	459	474	489	504	519	533	548	563	578	593
2	3	5	6	8	9	11	13	14	**17**	488	504	519	535	551	567	582	598	614	630
2	3	5	7	8	10	12	13	15	**18**	517	533	550	567	583	600	617	633	650	667
2	4	5	7	9	11	12	14	16	**19**	545	563	581	598	616	633	651	669	686	704
2	4	6	7	9	11	13	15	17	**20**	574	593	611	630	648	667	685	704	722	741
2	4	6	8	10	12	14	16	18	**21**	603	622	642	661	681	700	719	739	758	778
2	4	6	8	10	12	14	16	18	**22**	631	652	672	693	713	733	754	774	794	815
2	4	6	9	11	13	15	17	19	**23**	660	681	703	724	745	767	788	809	831	852
2	4	7	9	11	13	16	18	20	**24**	689	711	733	756	778	800	822	844	867	889
2	5	7	9	12	14	16	19	21	**25**	718	741	764	787	810	833	856	880	903	926
2	5	7	10	12	14	17	19	22	**26**	746	770	794	819	843	867	891	915	939	963
3	5	8	10	13	15	18	20	23	**27**	775	800	825	850	875	900	925	950	975	1000
3	5	8	10	13	16	18	21	23	**28**	804	830	856	881	907	933	959	985	1011	1037
3	5	8	11	13	16	19	21	24	**29**	832	859	886	913	940	967	994	1020	1047	1074
3	6	8	11	14	17	19	22	25	**30**	861	889	917	944	972	1000	1028	1056	1083	1111
3	6	9	11	14	17	20	23	26	**31**	890	919	947	976	1005	1033	1062	1091	1119	1148
3	6	9	12	15	18	21	24	27	**32**	919	948	978	1007	1037	1067	1096	1126	1156	1185
3	6	9	12	15	18	21	24	28	**33**	947	978	1008	1039	1069	1100	1131	1161	1192	1222
3	6	9	13	16	19	22	25	28	**34**	976	1007	1039	1070	1102	1133	1165	1196	1228	1259
3	6	10	13	16	19	23	26	29	**35**	1005	1037	1069	1102	1134	1167	1199	1231	1264	1296
3	7	10	13	17	20	23	27	30	**36**	1033	1067	1100	1133	1167	1200	1233	1267	1300	1333
3	7	10	14	17	21	24	27	31	**37**	1062	1096	1131	1165	1199	1233	1268	1302	1336	1370
4	7	11	14	18	21	25	28	32	**38**	1091	1126	1161	1196	1231	1267	1302	1337	1372	1407
4	7	11	14	18	22	25	29	33	**39**	1119	1156	1192	1228	1264	1300	1336	1372	1408	1444
4	7	11	15	19	22	26	30	33	**40**	1148	1185	1222	1259	1296	1333	1370	1407	1444	1481
4	8	11	15	19	23	27	30	34	**41**	1177	1215	1253	1291	1329	1367	1405	1443	1481	1519
4	8	12	16	19	23	27	31	35	**42**	1206	1244	1283	1322	1361	1400	1439	1478	1517	1556
4	8	12	16	20	24	28	32	36	**43**	1234	1274	1314	1354	1394	1433	1473	1513	1553	1593
4	8	12	16	20	24	29	33	37	**44**	1263	1304	1344	1385	1426	1467	1507	1548	1589	1630
4	8	13	17	21	25	29	33	38	**45**	1292	1333	1375	1417	1458	1500	1542	1583	1625	1667
4	9	13	17	21	26	30	34	38	**46**	1320	1363	1406	1448	1491	1533	1576	1619	1661	1 704
4	9	13	17	22	26	30	35	39	**47**	1349	1393	1436	1480	1523	1567	1610	1654	1697	1 741
4	9	13	18	22	27	31	36	40	**48**	1378	1422	1467	1511	1556	1600	1644	1689	1733	1 778
5	9	14	18	23	27	32	36	41	**49**	1406	1452	1497	1543	1588	1633	1679	1724	1769	1 815
5	9	14	19	23	28	32	37	42	**50**	1435	1481	1528	1574	1620	1667	1713	1759	1806	1 852
.1	.2	.3	.4	.5	.6	.7	.8	.9		**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**

Corrections for tenths of width										
	0.1	3	3	3	3	3	3	3	4	4	4
	0.2	6	6	6	6	6	7	7	7	7	7
	0.3	9	9	9	9	10	10	10	11	11	11
	0.4	11	12	12	13	13	13	14	14	14	15
	0.5	14	15	15	16	16	17	17	18	18	19
	0.6	17	18	18	19	19	20	21	21	22	22
	0.7	20	21	21	22	23	23	24	25	25	26
	0.8	23	24	24	25	26	27	27	28	29	30
	0.9	26	27	28	28	29	30	31	32	33	33

Corrections for tenths of height.

.1	.2	.3	.4	.5	.6	.7	.8	.9	WIDTH	31	32	33	34	35	36	37	38	39	40
5	9	14	19	24	28	33	38	43	**51**	1464	1511	1558	1606	1653	1700	1747	1794	1842	1889
5	10	14	19	24	29	34	39	43	**52**	1493	1541	1589	1637	1685	1733	1781	1830	1878	1926
5	10	15	20	25	29	34	39	44	**53**	1521	1570	1619	1669	1718	1767	1816	1865	1914	1963
5	10	15	20	25	30	35	40	45	**54**	1550	1600	1650	1700	1750	1800	1850	1900	1950	2000
5	10	15	20	25	31	36	41	46	**55**	1579	1630	1681	1731	1782	1833	1884	1935	1986	2037
5	10	16	21	26	31	36	41	47	**56**	1607	1659	1711	1763	1815	1867	1919	1970	2022	2074
5	11	16	21	26	32	37	42	48	**57**	1636	1689	1742	1794	1847	1900	1953	2006	2058	2111
5	11	16	21	27	32	38	43	48	**58**	1665	1719	1772	1826	1880	1933	1987	2041	2094	2148
5	11	16	22	27	33	38	44	49	**59**	1694	1748	1803	1857	1912	1967	2021	2076	2131	2185
6	11	17	22	28	33	39	44	50	**60**	1722	1778	1833	1889	1944	2000	2056	2111	2167	2222
6	11	17	23	28	34	40	45	51	**61**	1751	1807	1864	1920	1977	2033	2090	2146	2203	2259
6	11	17	23	29	34	40	46	52	**62**	1780	1837	1894	1952	2009	2067	2124	2181	2239	2296
6	12	18	23	29	35	41	47	53	**63**	1808	1867	1925	1983	2042	2100	2158	2217	2275	2333
6	12	18	24	30	36	41	47	53	**64**	1837	1896	1956	2015	2074	2133	2193	2252	2311	2370
6	12	18	24	30	36	42	48	54	**65**	1866	1926	1986	2046	2106	2167	2227	2287	2347	2407
6	12	18	24	31	37	43	49	55	**66**	1894	1956	2017	2078	2139	2200	2261	2322	2383	2444
6	12	19	25	31	37	43	50	56	**67**	1923	1985	2047	2109	2171	2233	2295	2357	2419	2481
6	13	19	25	31	38	44	50	57	**68**	1952	2015	2078	2141	2204	2267	2330	2393	2456	2519
6	13	19	26	32	38	45	51	58	**69**	1981	2044	2108	2172	2236	2300	2364	2428	2492	2556
6	13	19	26	32	39	45	52	58	**70**	2009	2074	2139	2204	2269	2333	2398	2463	2528	2593
7	13	20	26	33	39	46	53	59	**71**	2038	2104	2169	2235	2301	2367	2432	2498	2564	2630
7	13	20	27	33	40	47	53	60	**72**	2067	2133	2200	2267	2333	2400	2467	2533	2600	2667
7	14	20	27	34	41	47	54	61	**73**	2095	2163	2231	2298	2366	2433	2501	2569	2636	2704
7	14	21	27	34	41	48	55	62	**74**	2124	2193	2261	2330	2398	2467	2535	2604	2672	2741
7	14	21	28	35	42	49	56	63	**75**	2153	2222	2292	2361	2431	2500	2569	2639	2708	2778
7	14	21	28	35	42	49	56	63	**76**	2181	2252	2322	2393	2463	2533	2604	2674	2744	2815
7	14	21	29	36	43	50	57	64	**77**	2210	2281	2353	2424	2495	2567	2638	2709	2781	2852
7	14	22	29	36	43	51	58	65	**78**	2239	2311	2383	2456	2528	2600	2672	2744	2817	2889
7	15	22	29	37	44	51	59	66	**79**	2268	2341	2414	2487	2560	2633	2706	2780	2853	2926
7	15	22	30	37	44	52	59	67	**80**	2296	2370	2444	2519	2593	2667	2741	2815	2889	2963
8	15	23	30	38	45	53	60	68	**81**	2325	2400	2475	2550	2625	2700	2775	2850	2925	3000
8	15	23	30	38	46	53	61	68	**82**	2354	2430	2506	2581	2657	2733	2809	2885	2961	3037
8	15	23	31	38	46	54	61	69	**83**	2382	2459	2536	2613	2690	2767	2844	2920	2997	3074
8	16	23	31	39	47	54	62	70	**84**	2411	2489	2567	2644	2722	2800	2878	2956	3033	3111
8	16	24	31	39	47	55	63	71	**85**	2440	2519	2597	2676	2755	2833	2912	2991	3069	3148
8	16	24	32	40	48	56	64	72	**86**	2469	2548	2628	2707	2787	2867	2946	3026	3106	3185
8	16	24	32	40	48	56	64	73	**87**	2497	2578	2658	2739	2819	2900	2981	3061	3142	3222
8	16	24	33	41	49	57	65	73	**88**	2526	2607	2689	2770	2852	2933	3015	3096	3178	3259
8	16	25	33	41	49	58	66	74	**89**	2555	2637	2719	2802	2884	2967	3049	3131	3214	3296
8	17	25	33	42	50	58	67	75	**90**	2583	2667	2750	2833	2917	3000	3083	3167	3250	3333
8	17	25	34	42	51	59	67	76	**91**	2612	2696	2781	2865	2949	3033	3118	3202	3286	3370
9	17	26	34	43	51	60	68	77	**92**	2641	2726	2811	2896	2981	3067	3152	3237	3322	3407
9	17	26	34	43	52	60	69	78	**93**	2669	2756	2842	2928	3014	3100	3186	3272	3358	3444
9	17	26	35	44	52	61	70	78	**94**	2698	2785	2872	2959	3046	3133	3220	3307	3394	3481
9	18	26	35	44	53	62	70	79	**95**	2727	2815	2903	2991	3079	3167	3255	3343	3431	3519
9	18	27	36	44	53	62	71	80	**96**	2756	2844	2933	3022	3111	3200	3289	3378	3467	3556
9	18	27	36	45	54	63	72	81	**97**	2784	2874	2964	3054	3144	3233	3323	3413	3503	3593
9	18	27	36	45	54	64	73	82	**98**	2813	2904	2994	3085	3176	3267	3357	3448	3539	3630
9	18	28	37	46	55	64	73	83	**99**	2842	2933	3025	3117	3208	3300	3392	3483	3575	3667
9	19	28	37	46	56	65	74	83	**100**	2870	2963	3056	3148	3241	3333	3426	3519	3611	3704
.1	.2	.3	.4	.5	.6	.7	.8	.9		31	32	33	34	35	36	37	38	39	40

Corrections for tenths of width.	0.1	3	3	3	3	3	3	3	4	4	4
	0.2	6	6	6	6	6	7	7	7	7	7
	0.3	9	9	9	9	10	10	10	11	11	11
	0.4	11	12	12	13	13	13	14	14	14	15
	0.5	14	15	15	16	16	17	17	18	18	19
	0.6	17	18	18	19	19	20	21	21	22	22
	0.7	20	21	21	22	23	23	24	25	25	26
	0.8	23	24	24	25	26	27	27	28	29	30
	0.9	26	27	28	28	29	30	31	32	33	33

Corrections for tenths of height.

.1	.2	.3	.4	.5	.6	.7	.8	.9	WIDTH	41	42	43	44	45	46	47	48	49	50
					1	1	1	1	1	38	39	40	41	42	43	44	44	45	46
		1	1	1	1	1	1	2	2	76	78	80	81	83	85	87	89	91	93
	1	1	1	1	2	2	2	3	3	114	117	119	122	125	128	131	133	136	139
	1	1	1	2	2	3	3	3	4	152	156	159	163	167	170	174	178	181	185
	1	1	2	2	3	3	4	4	5	190	194	199	204	208	213	218	222	227	231
1	1	2	2	3	3	4	4	5	6	228	233	239	244	250	256	261	267	272	278
1	1	2	3	3	4	5	5	6	7	266	272	279	285	292	298	305	311	318	324
1	1	2	3	4	4	5	6	7	8	304	311	319	326	333	341	348	356	363	370
1	2	3	3	4	5	6	7	8	9	342	350	358	367	375	383	392	400	408	417
1	2	3	4	5	6	6	7	8	10	380	389	398	407	417	426	435	444	454	463
1	2	3	4	5	6	7	8	9	11	418	428	438	448	458	469	479	489	499	509
1	2	3	4	6	7	8	9	10	12	456	467	478	489	500	511	522	533	544	556
1	2	4	5	6	7	8	10	11	13	494	506	518	530	542	554	566	578	590	602
1	3	4	5	6	8	9	10	12	14	531	544	557	570	583	596	609	622	635	648
1	3	4	6	7	8	10	11	13	15	569	583	597	611	625	639	653	667	681	694
1	3	4	6	7	9	10	12	13	16	607	622	637	652	667	681	696	711	726	741
2	3	5	6	8	9	11	13	14	17	645	661	677	693	708	724	740	756	771	787
2	3	5	7	8	10	12	13	15	18	683	700	717	733	750	767	783	800	817	833
2	4	5	7	9	11	12	14	16	19	721	739	756	774	792	809	827	844	862	880
2	4	6	7	9	11	13	15	17	20	759	778	796	815	833	852	870	889	907	926
2	4	6	8	10	12	14	16	18	21	797	817	836	856	875	894	914	933	953	972
2	4	6	8	10	12	14	16	18	22	835	856	876	896	917	937	957	978	998	1019
2	4	6	9	11	13	15	17	19	23	873	894	916	937	958	980	1001	1022	1044	1065
2	4	7	9	11	13	16	18	20	24	911	933	956	978	1000	1022	1044	1067	1089	1111
2	5	7	9	12	14	16	19	21	25	949	972	995	1019	1042	1065	1088	1111	1134	1157
2	5	7	10	12	14	17	19	22	26	987	1011	1035	1059	1083	1107	1131	1156	1180	1204
3	5	8	10	13	15	18	20	23	27	1025	1050	1075	1100	1125	1150	1175	1200	1225	1250
3	5	8	10	13	16	18	21	23	28	1063	1089	1115	1141	1167	1193	1219	1244	1270	1296
3	5	8	11	13	16	19	21	24	29	1101	1128	1155	1181	1208	1235	1262	1289	1316	1343
3	6	8	11	14	17	19	22	25	30	1139	1167	1194	1222	1250	1278	1306	1333	1361	1389
3	6	9	11	14	17	20	23	26	31	1177	1206	1234	1263	1292	1320	1349	1378	1406	1435
3	6	9	12	15	18	21	24	27	32	1215	1244	1274	1304	1333	1363	1393	1422	1452	1481
3	6	9	12	15	18	21	24	28	33	1253	1283	1314	1344	1375	1406	1436	1467	1497	1528
3	6	9	13	16	19	22	25	28	34	1291	1322	1354	1385	1417	1448	1480	1511	1543	1574
3	6	10	13	16	19	23	26	29	35	1329	1361	1394	1426	1458	1491	1523	1556	1588	1620
3	7	10	13	17	20	23	27	30	36	1367	1400	1433	1467	1500	1533	1567	1600	1633	1667
3	7	10	14	17	20	24	27	31	37	1405	1439	1473	1507	1542	1576	1610	1644	1679	1713
4	7	11	14	18	21	25	28	32	38	1443	1478	1513	1548	1583	1619	1654	1689	1724	1759
4	7	11	14	18	22	25	29	33	39	1481	1517	1553	1589	1625	1661	1697	1733	1769	1806
4	7	11	15	19	22	26	30	33	40	1519	1556	1593	1630	1667	1704	1741	1778	1815	1852
4	8	11	15	19	23	27	30	34	41	1556	1594	1632	1670	1708	1746	1784	1822	1860	1898
4	8	12	16	19	23	27	31	35	42	1594	1633	1672	1711	1750	1789	1828	1867	1906	1944
4	8	12	16	20	24	28	32	36	43	1632	1672	1712	1752	1792	1831	1871	1911	1951	1991
4	8	12	16	20	24	29	33	37	44	1670	1711	1752	1793	1833	1874	1915	1956	1996	2037
4	8	13	17	21	25	29	33	38	45	1708	1750	1792	1833	1875	1917	1958	2000	2042	2083
4	9	13	17	21	26	30	34	38	46	1746	1789	1831	1874	1917	1959	2002	2044	2087	2130
4	9	13	17	22	26	30	35	39	47	1784	1828	1871	1915	1958	2002	2045	2089	2132	2176
4	9	13	18	22	27	31	36	40	48	1822	1867	1911	1956	2000	2044	2089	2133	2178	2222
5	9	14	18	23	27	32	36	41	49	1860	1906	1951	1996	2042	2087	2132	2178	2223	2269
5	9	14	19	23	28	32	37	42	50	1898	1944	1991	2037	2083	2130	2176	2222	2269	2315
.1	.2	.3	.4	.5	.6	.7	.8	.9		41	42	43	44	45	46	47	48	49	50

Corrections for tenths of width.										
0.1	4	4	4	4	4	4	4	4	5	5
0.2	8	8	8	8	8	9	9	9	9	9
0.3	11	12	12	12	13	13	13	13	14	14
0.4	15	16	16	16	17	17	17	18	18	19
0.5	19	19	20	20	21	21	22	22	23	23
0.6	23	23	24	24	25	26	26	27	27	28
0.7	27	27	28	29	29	30	30	31	32	32
0.8	30	31	32	33	33	34	35	36	36	37
0.9	34	35	36	37	38	38	39	40	41	42

Corrections for tenths of height.

.1	.2	.3	.4	.5	.6	.7	.8	.9	WIDTH	41	42	43	44	45	46	47	48	49	50
5	9	14	19	24	28	33	38	42	**51**	1936	1983	2031	2078	2125	2172	2219	2267	2314	2361
5	10	14	19	24	29	34	39	43	**52**	1974	2022	2070	2119	2167	2215	2263	2311	2359	2407
5	10	15	20	25	29	34	39	44	**53**	2012	2061	2110	2159	2208	2257	2306	2356	2405	2454
5	10	15	20	25	30	35	40	45	**54**	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500
5	10	15	20	25	31	36	41	46	**55**	2088	2139	2190	2241	2292	2343	2394	2444	2495	2546
5	10	16	21	26	31	36	41	47	**56**	2126	2178	2230	2281	2333	2385	2437	2489	2541	2593
5	11	16	21	26	32	37	42	47	**57**	2164	2217	2269	2322	2375	2428	2481	2533	2586	2639
5	11	16	21	27	32	38	43	48	**58**	2202	2256	2309	2363	2417	2470	2524	2578	2631	2685
5	11	16	22	27	33	38	44	49	**59**	2240	2294	2349	2404	2458	2513	2568	2622	2677	2731
6	11	17	22	28	33	39	44	50	**60**	2278	2333	2389	2444	2500	2556	2611	2667	2722	2778
6	11	17	23	28	34	40	45	51	**61**	2316	2372	2429	2485	2542	2598	2655	2711	2768	2824
6	11	17	23	29	34	40	46	52	**62**	2354	2411	2469	2526	2583	2641	2698	2756	2813	2870
6	12	18	23	29	35	41	47	53	**63**	2392	2450	2508	2567	2625	2683	2742	2800	2858	2917
6	12	18	24	30	36	41	47	53	**64**	2430	2489	2548	2607	2667	2726	2785	2844	2904	2963
6	12	18	24	30	36	42	48	54	**65**	2468	2528	2588	2648	2708	2769	2829	2889	2949	3009
6	12	18	24	31	37	43	49	55	**66**	2506	2567	2628	2689	2750	2811	2872	2933	2994	3056
6	12	19	25	31	37	43	50	56	**67**	2544	2606	2668	2730	2792	2854	2916	2978	3040	3102
6	13	19	25	31	38	44	50	57	**68**	2581	2644	2707	2770	2833	2896	2959	3022	3085	3148
6	13	19	26	32	38	45	51	58	**69**	2619	2683	2747	2811	2875	2939	3003	3067	3131	3194
6	13	19	26	32	39	45	52	58	**70**	2657	2722	2787	2852	2917	2981	3046	3111	3176	3241
7	13	20	26	33	39	46	53	59	**71**	2695	2761	2827	2893	2958	3024	3090	3156	3221	3287
7	13	20	27	33	40	47	53	60	**72**	2733	2800	2867	2933	3000	3067	3133	3200	3267	3333
7	14	20	27	34	41	47	54	61	**73**	2771	2839	2906	2974	3042	3109	3177	3244	3312	3380
7	14	21	27	34	41	48	55	62	**74**	2809	2878	2946	3015	3083	3152	3220	3289	3357	3426
7	14	21	28	35	42	49	56	63	**75**	2847	2917	2986	3056	3125	3194	3264	3333	3403	3472
7	14	21	28	35	42	49	56	63	**76**	2885	2956	3026	3096	3167	3237	3307	3378	3448	3519
7	14	21	29	36	43	50	57	64	**77**	2923	2994	3066	3137	3208	3280	3351	3422	3494	3565
7	14	22	29	36	43	51	58	65	**78**	2961	3033	3106	3178	3250	3322	3394	3467	3539	3611
7	15	22	29	37	44	51	59	66	**79**	2999	3072	3145	3219	3292	3365	3438	3511	3584	3657
7	15	22	30	37	44	52	59	67	**80**	3037	3111	3185	3259	3333	3407	3481	3556	3630	3704
8	15	23	30	37	45	53	60	68	**81**	3075	3150	3225	3300	3375	3450	3525	3600	3675	3750
8	15	23	30	38	46	53	61	68	**82**	3113	3189	3265	3341	3417	3493	3569	3644	3720	3796
8	15	23	31	38	46	54	61	69	**83**	3151	3228	3305	3381	3458	3535	3612	3689	3766	3843
8	16	23	31	39	47	54	62	70	**84**	3189	3267	3344	3422	3500	3578	3656	3733	3811	3889
8	16	24	31	39	47	55	63	71	**85**	3227	3306	3384	3463	3542	3620	3699	3778	3856	3935
8	16	24	32	40	48	56	64	72	**86**	3265	3344	3424	3504	3583	3663	3743	3822	3902	3981
8	16	24	32	40	48	56	64	73	**87**	3303	3383	3464	3544	3625	3706	3786	3867	3947	4028
8	16	24	33	41	49	57	65	73	**88**	3341	3422	3504	3585	3667	3748	3830	3911	3993	4074
8	16	25	33	41	49	58	66	74	**89**	3379	3461	3544	3626	3708	3791	3873	3956	4038	4120
8	17	25	33	42	50	58	67	75	**90**	3417	3500	3583	3667	3750	3833	3917	4000	4083	4167
8	17	25	34	42	51	59	67	76	**91**	3455	3539	3623	3707	3792	3876	3960	4044	4129	4213
9	17	26	34	43	51	60	68	77	**92**	3493	3578	3663	3748	3833	3919	4004	4089	4174	4259
9	17	26	34	43	52	60	69	78	**93**	3531	3617	3703	3789	3875	3961	4047	4133	4219	4306
9	17	26	35	44	52	61	70	78	**94**	3569	3656	3743	3830	3917	4004	4091	4178	4265	4352
9	18	26	35	44	53	62	70	79	**95**	3606	3694	3782	3870	3958	4046	4134	4222	4310	4398
9	18	27	36	44	53	62	71	80	**96**	3644	3733	3822	3911	4000	4089	4178	4267	4356	4444
9	18	27	36	45	54	63	72	81	**97**	3682	3772	3862	3952	4042	4131	4221	4311	4401	4491
9	18	27	36	45	54	64	73	82	**98**	3720	3811	3902	3993	4083	4174	4265	4356	4446	4537
9	18	28	37	46	55	64	73	83	**99**	3758	3850	3942	4033	4125	4217	4308	4400	4492	4583
9	19	28	37	46	56	65	74	83	**100**	3796	3889	3981	4074	4167	4259	4352	4444	4537	4630
.1	.2	.3	.4	.5	.6	.7	.8	.9		**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**

Corrections for tenths of width.										
0.1	4	4	4	4	4	4	4	4	5	5
0.2	8	8	8	8	8	9	9	9	9	9
0.3	11	12	12	12	13	13	13	13	14	14
0.4	15	16	16	16	17	17	17	18	18	19
0.5	19	19	20	20	21	21	22	22	23	23
0.6	23	23	24	24	25	26	26	27	27	28
0.7	27	27	28	29	29	30	30	31	32	32
0.8	30	31	32	33	33	34	35	36	36	37
0.9	34	35	36	37	38	38	39	40	41	42

Corrections for tenths of height.

.1	.2	.3	.4	.5	.6	.7	.8	.9	WIDTH	51	52	53	54	55	56	57	58	59	60
					1	1	1	1	1	47	48	49	50	51	52	53	54	55	56
		1	1	1	1	1	1	2	2	94	96	98	100	102	104	106	107	109	111
	1	1	1	1	2	2	2	3	3	142	144	147	150	153	156	158	161	164	167
	1	1	1	2	2	3	3	3	4	189	193	196	200	204	207	211	215	219	222
	1	1	2	2	3	3	4	4	5	236	241	245	250	255	259	264	269	273	278
1	1	2	2	3	3	4	4	5	6	283	289	294	300	306	311	317	322	328	333
1	1	2	3	3	4	5	5	6	7	331	337	344	350	356	363	369	376	382	389
1	1	2	3	4	4	5	6	7	8	378	385	393	400	407	415	422	430	437	444
1	2	2	3	4	5	6	7	7	9	425	433	442	450	458	467	475	483	492	500
1	2	3	4	5	6	6	7	8	10	472	481	491	500	509	519	528	537	546	556
1	2	3	4	5	6	7	8	9	11	519	530	540	550	560	570	581	591	601	611
1	2	3	4	6	7	8	9	10	12	567	578	589	600	611	622	633	644	656	667
1	2	4	5	6	7	8	10	11	13	614	626	638	650	662	674	686	698	710	722
1	3	4	5	6	8	9	10	12	14	661	674	687	700	713	726	739	752	765	778
1	3	4	6	7	8	10	11	12	15	708	722	736	750	764	778	792	806	819	833
1	3	4	6	7	9	10	12	13	16	756	770	785	800	815	830	844	859	874	889
2	3	5	6	8	9	11	13	14	17	803	819	834	850	866	881	897	913	929	944
2	3	5	7	8	10	12	13	15	18	850	867	883	900	917	933	950	967	983	1000
2	4	5	7	9	11	12	14	16	19	897	915	932	950	968	985	1003	1020	1038	1056
2	4	6	7	9	11	13	15	17	20	944	963	981	1000	1019	1037	1056	1074	1093	1111
2	4	6	8	10	12	14	16	17	21	992	1011	1031	1050	1069	1089	1108	1128	1147	1167
2	4	6	8	10	12	14	16	18	22	1039	1059	1080	1100	1120	1141	1161	1181	1202	1222
2	4	6	9	11	13	15	17	19	23	1086	1107	1129	1150	1171	1193	1214	1235	1256	1278
2	4	7	9	11	13	16	18	20	24	1133	1156	1178	1200	1222	1244	1267	1289	1311	1333
2	5	7	9	12	14	16	19	21	25	1181	1204	1227	1250	1273	1296	1319	1343	1366	1389
2	5	7	10	12	14	17	19	22	26	1228	1252	1276	1300	1324	1348	1372	1396	1420	1444
3	5	7	10	12	15	17	20	22	27	1275	1300	1325	1350	1375	1400	1425	1450	1475	1500
3	5	8	10	13	16	18	21	23	28	1322	1348	1374	1400	1426	1452	1478	1504	1530	1556
3	5	8	11	13	16	19	21	24	29	1369	1396	1423	1450	1477	1504	1531	1557	1584	1611
3	6	8	11	14	17	19	22	25	30	1417	1444	1472	1500	1528	1556	1583	1611	1639	1667
3	6	9	11	14	17	20	23	26	31	1464	1493	1521	1550	1579	1607	1636	1665	1694	1722
3	6	9	12	15	18	21	24	27	32	1511	1541	1570	1600	1630	1659	1689	1719	1748	1778
3	6	9	12	15	18	21	24	28	33	1558	1589	1619	1650	1681	1711	1742	1772	1803	1833
3	6	9	13	16	19	22	25	28	34	1606	1637	1669	1700	1731	1763	1794	1826	1857	1889
3	6	10	13	16	19	23	26	29	35	1653	1685	1718	1750	1782	1815	1847	1880	1912	1944
3	7	10	13	17	20	23	27	30	36	1700	1733	1767	1800	1833	1867	1900	1933	1967	2000
3	7	10	14	17	21	24	27	31	37	1747	1781	1816	1850	1884	1919	1953	1987	2021	2056
4	7	11	14	18	21	25	28	32	38	1794	1830	1865	1900	1935	1970	2006	2041	2076	2111
4	7	11	14	18	22	25	29	32	39	1842	1878	1914	1950	1986	2022	2058	2094	2131	2167
4	7	11	15	19	22	26	30	33	40	1889	1926	1963	2000	2037	2074	2111	2148	2185	2222
4	8	11	15	19	23	27	30	34	41	1936	1974	2012	2050	2088	2126	2164	2202	2240	2278
4	8	12	16	19	23	27	31	35	42	1983	2022	2061	2100	2139	2178	2217	2256	2294	2333
4	8	12	16	20	24	28	32	36	43	2031	2070	2110	2150	2190	2230	2269	2309	2349	2389
4	8	12	16	20	24	29	33	37	44	2078	2119	2159	2200	2241	2281	2322	2363	2404	2444
4	8	12	17	21	25	29	33	37	45	2125	2167	2208	2250	2292	2333	2375	2417	2458	2500
4	9	13	17	21	26	30	34	38	46	2172	2215	2257	2300	2343	2385	2428	2470	2513	2556
4	9	13	17	22	26	30	35	39	47	2219	2263	2306	2350	2394	2437	2481	2524	2568	2611
4	9	13	18	22	27	31	36	40	48	2267	2311	2356	2400	2444	2489	2533	2578	2622	2667
5	9	14	18	23	27	32	36	41	49	2314	2359	2405	2450	2495	2541	2586	2631	2677	2722
5	9	14	19	23	28	32	37	42	50	2361	2407	2454	2500	2546	2593	2639	2685	2731	2778
.1	.2	.3	.4	.5	.6	.7	.8	.9		51	52	53	54	55	56	57	58	59	60

Corrections for tenths of width.										
0.1	5	5	5	5	5	5	5	5	5	6
0.2	9	10	10	10	10	10	11	11	11	11
0.3	14	14	15	15	15	16	16	16	16	17
0.4	19	19	20	20	20	21	21	21	22	22
0.5	24	24	25	25	25	26	26	27	27	28
0.6	28	29	29	30	31	31	32	32	33	33
0.7	33	34	34	35	36	36	37	38	38	39
0.8	38	39	39	40	41	41	42	43	44	44
0.9	42	43	44	45	46	47	47	48	49	50

Corrections for tenths of height.

.1	.2	.3	.4	.5	.6	.7	.8	.9	WIDTH	51	52	53	54	55	56	57	58	59	60
5	9	14	19	24	28	33	38	42	**51**	2408	2456	2503	2550	2597	2644	2692	2739	2786	2833
5	10	14	19	24	29	34	39	43	**52**	2456	2504	2552	2600	2648	2696	2744	2793	2841	2889
5	10	15	20	25	29	34	39	44	**53**	2503	2552	2601	2650	2699	2748	2797	2846	2895	2944
5	10	15	20	25	30	35	40	45	**54**	2550	2600	2650	2700	2750	2800	2850	2900	2950	3000
5	10	15	20	25	31	36	41	46	**55**	2597	2648	2699	2750	2801	2852	2903	2954	3005	3056
5	10	16	21	26	31	36	41	47	**56**	2644	2696	2748	2800	2852	2904	2956	3007	3059	3111
5	11	16	21	26	32	37	42	47	**57**	2692	2744	2797	2850	2903	2956	3008	3061	3114	3167
5	11	16	21	27	32	38	43	48	**58**	2739	2793	2846	2900	2954	3007	3061	3115	3169	3222
5	11	16	22	27	33	38	44	49	**59**	2786	2841	2895	2950	3005	3059	3114	3169	3223	3278
6	11	17	22	28	33	39	44	50	**60**	2833	2889	2944	3000	3056	3111	3167	3222	3278	3333
6	11	17	23	28	34	40	45	51	**61**	2881	2937	2994	3050	3106	3163	3219	3276	3332	3389
6	11	17	23	29	34	40	46	52	**62**	2928	2985	3043	3100	3157	3215	3272	3330	3387	3444
6	12	17	23	29	35	41	47	52	**63**	2975	3033	3092	3150	3208	3267	3325	3383	3442	3500
6	12	18	23	30	36	41	47	53	**64**	3022	3081	3141	3200	3259	3319	3378	3437	3496	3556
6	12	18	24	30	36	42	48	54	**65**	3069	3130	3190	3250	3310	3370	3431	3491	3551	3611
6	12	18	24	31	37	43	49	55	**66**	3117	3178	3239	3300	3361	3422	3483	3544	3606	3667
6	12	19	25	31	37	43	50	56	**67**	3164	3226	3288	3350	3412	3474	3536	3598	3660	3722
6	13	19	25	31	38	44	50	57	**68**	3211	3274	3337	3400	3463	3526	3589	3652	3715	3778
6	13	19	26	32	38	45	51	57	**69**	3258	3322	3386	3450	3514	3578	3642	3706	3769	3833
6	13	19	26	32	39	45	52	58	**70**	3306	3370	3435	3500	3565	3630	3694	3759	3824	3889
7	13	20	26	33	39	46	53	59	**71**	3353	3419	3484	3550	3616	3681	3747	3813	3879	3944
7	13	20	27	33	40	47	53	60	**72**	3400	3467	3533	3600	3667	3733	3800	3867	3933	4000
7	14	20	27	34	41	47	54	61	**73**	3447	3515	3582	3650	3718	3785	3853	3920	3988	4056
7	14	21	27	34	41	48	55	62	**74**	3494	3563	3631	3700	3769	3837	3906	3974	4043	4111
7	14	21	28	35	42	49	56	62	**75**	3542	3611	3681	3750	3819	3889	3958	4028	4097	4167
7	14	21	28	35	42	49	56	63	**76**	3589	3659	3730	3800	3870	3941	4011	4081	4152	4222
7	14	21	29	36	43	50	57	64	**77**	3636	3707	3779	3850	3921	3993	4064	4135	4206	4278
7	14	22	29	36	43	51	58	65	**78**	3683	3756	3828	3900	3972	4044	4117	4189	4261	4333
7	15	22	29	37	44	51	59	66	**79**	3731	3804	3877	3950	4023	4096	4169	4243	4316	4389
7	15	22	30	37	44	52	59	67	**80**	3778	3852	3926	4000	4074	4148	4222	4296	4370	4444
7	15	22	30	37	45	52	60	67	**81**	3825	3900	3975	4050	4125	4200	4275	4350	4425	4500
8	15	23	30	38	46	53	61	68	**82**	3872	3948	4024	4100	4176	4252	4328	4404	4480	4556
8	15	23	31	38	46	54	61	69	**83**	3919	3996	4073	4150	4227	4304	4381	4457	4534	4611
8	16	23	31	39	47	54	62	70	**84**	3967	4044	4122	4200	4278	4356	4433	4511	4589	4667
8	16	24	31	39	47	55	63	71	**85**	4014	4093	4171	4250	4329	4407	4486	4565	4644	4722
8	16	24	32	40	48	56	64	72	**86**	4061	4141	4220	4300	4380	4459	4539	4619	4698	4778
8	16	24	32	40	48	56	64	73	**87**	4108	4189	4269	4350	4431	4511	4592	4672	4753	4833
8	16	24	33	41	49	57	65	73	**88**	4156	4237	4319	4400	4481	4563	4644	4726	4807	4889
8	16	25	33	41	49	58	66	74	**89**	4203	4285	4368	4450	4532	4615	4697	4780	4862	4944
8	17	25	33	42	50	58	67	75	**90**	4250	4333	4417	4500	4583	4667	4750	4833	4917	5000
8	17	25	34	42	51	59	67	76	**91**	4297	4381	4466	4550	4634	4719	4803	4887	4971	5056
9	17	26	34	43	51	60	68	77	**92**	4344	4430	4515	4600	4685	4770	4856	4941	5026	5111
9	17	26	34	43	52	60	69	77	**93**	4392	4478	4564	4650	4736	4822	4908	4994	5081	5167
9	17	26	35	44	52	61	70	78	**94**	4439	4526	4613	4700	4787	4874	4961	5048	5135	5222
9	18	26	35	44	53	62	70	79	**95**	4486	4574	4662	4750	4838	4926	5014	5102	5190	5278
9	18	27	36	44	53	62	71	80	**96**	4533	4622	4711	4800	4889	4978	5067	5156	5244	5333
9	18	27	36	45	54	63	72	81	**97**	4581	4670	4760	4850	4940	5030	5119	5209	5299	5389
9	18	27	36	45	54	64	73	82	**98**	4628	4719	4809	4900	4991	5081	5172	5263	5354	5444
9	18	27	37	46	55	64	73	82	**99**	4675	4767	4858	4950	5042	5133	5225	5317	5408	5500
9	19	28	37	46	55	65	74	83	**100**	4722	4815	4907	5000	5093	5185	5278	5370	5463	5556
.1	.2	.3	.4	.5	.6	.7	.8	.9		**51**	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**

Corrections for tenths of width.										
0.1	5	5	5	5	5	5	5	5	5	6
0.2	9	10	10	10	10	10	11	11	11	11
0.3	14	14	15	15	15	16	16	16	16	17
0.4	19	19	20	20	20	21	21	21	22	22
0.5	24	24	25	25	25	26	26	27	27	28
0.6	28	29	29	30	31	31	32	32	33	33
0.7	33	34	34	35	36	36	37	38	38	39
0.8	38	39	39	40	41	41	42	43	44	44
0.9	42	43	44	45	46	47	47	48	49	50

Corrections for tenths of height.

.1	.2	.3	.4	.5	.6	.7	.8	.9	WIDTH	1	2	3	4	5	6	7	8	9	10
9	19	28	37	47	56	65	75	84	**101**	94	187	281	374	468	561	655	748	842	935
9	19	28	38	47	57	66	76	85	**102**	94	189	283	378	472	567	661	756	850	944
10	19	29	38	48	57	67	76	86	**103**	95	191	286	381	477	572	668	763	858	954
10	19	29	39	48	58	67	77	87	**104**	96	193	289	385	481	578	674	770	867	963
10	19	29	39	49	58	68	78	87	**105**	97	194	292	389	486	583	681	778	875	972
10	20	29	39	49	59	69	79	88	**106**	98	196	294	393	491	589	687	785	883	981
10	20	30	40	50	59	69	79	89	**107**	99	198	297	396	495	594	694	793	892	991
10	20	30	40	50	60	70	80	90	**108**	100	200	300	400	500	600	700	800	900	1000
10	20	30	40	50	61	71	81	91	**109**	101	202	303	404	505	606	706	807	908	1009
10	20	31	41	51	61	71	81	92	**110**	102	204	306	407	509	611	713	815	917	1019
10	21	31	41	51	62	72	82	92	**111**	103	206	308	411	514	617	719	822	925	1028
10	21	31	41	52	62	73	83	93	**112**	104	207	311	415	519	622	726	830	933	1037
10	21	31	42	52	63	73	84	94	**113**	105	209	314	419	523	628	732	837	942	1046
11	21	32	42	53	63	74	84	95	**114**	106	211	317	422	528	633	739	844	950	1056
11	21	32	43	53	64	75	85	96	**115**	106	213	319	426	532	639	745	852	958	1065
11	21	32	43	54	64	75	86	97	**116**	107	215	322	430	537	644	752	859	967	1074
11	22	32	43	54	65	76	87	97	**117**	108	217	325	433	542	650	758	867	975	1083
11	22	33	44	55	66	76	87	98	**118**	109	219	328	437	546	656	765	874	983	1093
11	22	33	44	55	66	77	88	99	**119**	110	220	331	441	551	661	771	881	992	1102
11	22	33	44	56	67	78	89	100	**120**	111	222	333	444	556	667	778	889	1000	1111
11	22	34	45	56	67	78	90	101	**121**	112	224	336	448	560	672	784	896	1008	1120
11	23	34	45	56	68	79	90	102	**122**	113	226	339	452	565	678	791	904	1017	1130
11	23	34	46	57	68	80	91	102	**123**	114	228	342	456	569	683	797	911	1025	1139
11	23	34	46	57	69	80	92	103	**124**	115	230	344	459	574	689	804	919	1033	1148
12	23	35	46	58	69	81	93	104	**125**	116	231	347	463	579	694	810	926	1042	1157
12	23	35	47	58	70	81	93	105	**126**	117	233	350	467	583	700	817	933	1050	1167
12	24	35	47	59	71	82	94	106	**127**	118	235	353	470	588	706	823	941	1058	1176
12	24	36	47	59	71	83	95	107	**128**	119	237	356	474	593	711	830	948	1067	1185
12	24	36	48	60	72	84	96	107	**129**	119	239	358	478	597	717	836	956	1075	1194
12	24	36	48	60	72	84	96	108	**130**	120	241	361	481	602	722	843	963	1083	1204
12	24	36	49	61	73	85	97	109	**131**	121	243	364	485	606	728	849	970	1092	1213
12	24	37	49	61	73	86	98	110	**132**	122	244	367	489	611	733	856	978	1100	1222
12	25	37	49	62	74	86	99	111	**133**	123	246	369	493	616	739	862	985	1108	1231
12	25	37	50	62	74	87	99	112	**134**	124	248	372	496	620	744	869	993	1117	1241
12	25	37	50	62	75	87	100	112	**135**	125	250	375	500	625	750	875	1000	1125	1250
13	25	38	50	63	76	88	101	113	**136**	126	252	378	504	630	756	881	1007	1133	1259
13	25	38	51	63	76	89	101	114	**137**	127	254	381	507	634	761	888	1015	1142	1269
13	26	38	51	64	77	89	102	115	**138**	128	256	383	511	639	767	894	1022	1150	1278
13	26	39	51	64	77	90	103	116	**139**	129	257	386	515	644	772	901	1030	1158	1287
13	26	39	52	65	78	91	104	117	**140**	130	259	389	519	648	778	907	1037	1167	1296
13	26	39	52	65	78	91	104	118	**141**	131	261	392	522	653	783	914	1044	1175	1306
13	26	39	53	66	79	92	105	118	**142**	131	263	394	526	657	789	920	1052	1183	1315
13	26	40	53	66	79	93	106	119	**143**	132	265	397	530	662	794	927	1059	1192	1324
13	27	40	53	67	80	93	107	120	**144**	133	267	400	533	667	800	933	1067	1200	1333
13	27	40	54	67	81	94	107	121	**145**	134	269	403	537	671	806	940	1074	1208	1343
14	27	41	54	68	81	95	108	122	**146**	135	270	406	541	676	811	946	1081	1217	1352
14	27	41	54	68	82	95	109	122	**147**	136	272	408	544	681	817	953	1089	1225	1361
14	27	41	55	69	82	96	110	123	**148**	137	274	411	548	685	822	959	1096	1233	1370
14	28	41	55	69	83	97	110	124	**149**	138	276	414	552	690	828	966	1104	1242	1380
14	28	42	56	69	83	97	111	125	**150**	139	278	417	556	694	833	972	1111	1250	1389
.1	.2	.3	.4	.5	.6	.7	.8	.9		1	2	3	4	5	6	7	8	9	10

Corrections for tenths of width.

0.1						1	1	1	1
0.2			1	1	1	1	1	1	2
0.3		1	1	1	1	2	2	2	3
0.4		1	1	1	2	2	3	3	4
0.5		1	1	2	2	3	3	4	5
0.6	1	1	2	2	3	3	4	4	5	6
0.7	1	1	2	3	3	4	5	5	6	6
0.8	1	1	2	3	4	4	5	6	7	7
0.9	1	2	3	3	4	5	6	7	7	8

Corrections for tenths of height.

.1	.2	.3	.4	.5	.6	.7	.8	.9	WIDTH	11	12	13	14	15	16	17	18	19	20
9	19	28	37	47	56	65	75	84	**101**	1029	1122	1216	1309	1403	1496	1590	1683	1777	1870
9	19	28	38	47	57	66	76	85	**102**	1039	1133	1228	1322	1417	1511	1606	1700	1794	1889
10	19	29	38	48	57	67	76	86	**103**	1049	1144	1240	1335	1431	1526	1621	1717	1812	1907
10	19	29	39	48	58	67	77	87	**104**	1059	1156	1252	1348	1444	1541	1637	1733	1830	1926
10	19	29	39	49	58	68	78	87	**105**	1069	1167	1264	1361	1458	1556	1653	1750	1847	1944
10	20	29	39	49	59	69	79	88	**106**	1080	1178	1276	1374	1472	1570	1669	1767	1865	1963
10	20	30	40	50	59	69	79	89	**107**	1090	1189	1288	1387	1486	1585	1684	1783	1882	1981
10	20	30	40	50	60	70	80	90	**108**	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000
10	20	30	40	50	61	71	81	91	**109**	1110	1211	1312	1413	1514	1615	1716	1817	1918	2019
10	20	31	41	51	61	71	81	92	**110**	1120	1222	1324	1426	1528	1630	1731	1833	1935	2037
10	21	31	41	51	62	72	82	92	**111**	1131	1233	1336	1439	1542	1644	1747	1850	1953	2056
10	21	31	41	52	62	73	83	93	**112**	1141	1244	1348	1452	1556	1659	1763	1867	1970	2074
10	21	31	42	52	63	73	84	94	**113**	1151	1256	1360	1465	1569	1674	1779	1883	1988	2093
11	21	32	42	53	63	74	84	95	**114**	1161	1267	1372	1478	1583	1689	1794	1900	2006	2111
11	21	32	43	53	64	75	85	96	**115**	1171	1278	1384	1491	1597	1704	1810	1917	2023	2130
11	21	32	43	54	64	75	86	97	**116**	1181	1289	1396	1504	1611	1719	1826	1933	2041	2148
11	22	32	43	54	65	76	87	97	**117**	1192	1300	1408	1517	1625	1733	1842	1950	2058	2167
11	22	33	44	55	66	76	87	98	**118**	1202	1311	1420	1530	1639	1748	1857	1967	2076	2185
11	22	33	44	55	66	77	88	99	**119**	1212	1322	1432	1543	1653	1763	1873	1983	2094	2204
11	22	33	44	56	67	78	89	100	**120**	1222	1333	1444	1556	1667	1778	1889	2000	2111	2222
11	22	34	45	56	67	78	90	101	**121**	1232	1344	1456	1569	1681	1793	1905	2017	2129	2241
11	23	34	45	56	68	79	90	102	**122**	1243	1356	1469	1581	1694	1807	1920	2033	2146	2259
11	23	34	46	57	68	80	91	102	**123**	1253	1367	1481	1594	1708	1822	1936	2050	2164	2278
11	23	34	46	57	69	80	92	103	**124**	1263	1378	1493	1607	1722	1837	1952	2067	2181	2296
12	23	35	46	58	69	81	93	104	**125**	1273	1389	1505	1620	1736	1852	1968	2083	2199	2315
12	23	35	47	58	70	82	93	105	**126**	1283	1400	1517	1633	1750	1867	1983	2100	2217	2333
12	24	35	47	59	71	82	94	106	**127**	1294	1411	1529	1646	1764	1881	1999	2117	2234	2352
12	24	36	47	59	71	83	95	107	**128**	1304	1422	1541	1659	1778	1896	2015	2133	2252	2370
12	24	36	48	60	72	84	96	107	**129**	1314	1433	1553	1672	1792	1911	2031	2150	2269	2389
12	24	36	48	60	72	84	96	108	**130**	1324	1444	1565	1685	1806	1926	2046	2167	2287	2407
12	24	36	49	61	73	85	97	109	**131**	1334	1456	1577	1698	1819	1941	2062	2183	2305	2426
12	24	37	49	61	73	86	98	110	**132**	1344	1467	1589	1711	1833	1956	2078	2200	2322	2444
12	25	37	49	62	74	86	99	111	**133**	1355	1478	1601	1724	1847	1970	2094	2217	2340	2463
12	25	37	50	62	74	87	99	112	**134**	1365	1489	1613	1737	1861	1985	2109	2233	2357	2481
12	25	37	50	62	75	87	100	112	**135**	1375	1500	1625	1750	1875	2000	2125	2250	2375	2500
13	25	38	50	63	76	88	101	113	**136**	1385	1511	1637	1763	1889	2015	2141	2267	2393	2519
13	25	38	51	63	76	89	101	114	**137**	1395	1522	1649	1776	1903	2030	2156	2283	2410	2537
13	26	38	51	64	77	89	102	115	**138**	1406	1533	1661	1789	1917	2044	2172	2300	2428	2556
13	26	39	51	64	77	90	103	116	**139**	1416	1544	1673	1802	1931	2059	2188	2317	2445	2574
13	26	39	52	65	78	91	104	117	**140**	1426	1556	1685	1815	1944	2074	2204	2333	2463	2593
13	26	39	52	65	78	91	104	118	**141**	1436	1567	1697	1828	1958	2089	2219	2350	2481	2611
13	26	39	53	66	79	92	105	118	**142**	1446	1578	1709	1841	1972	2104	2235	2367	2498	2630
13	26	40	53	66	79	93	106	119	**143**	1456	1589	1721	1854	1986	2119	2251	2383	2516	2648
13	27	40	53	67	80	93	107	120	**144**	1467	1600	1733	1867	2000	2133	2267	2400	2533	2667
13	27	40	54	67	81	94	107	121	**145**	1477	1611	1745	1880	2014	2148	2282	2417	2551	2685
14	27	41	54	68	81	95	108	122	**146**	1487	1622	1757	1893	2028	2163	2298	2433	2569	2704
14	27	41	54	68	82	95	109	122	**147**	1497	1633	1769	1906	2042	2178	2314	2450	2586	2722
14	27	41	55	69	82	96	110	123	**148**	1507	1644	1781	1919	2056	2193	2330	2467	2604	2741
14	28	41	55	69	83	97	110	124	**149**	1518	1656	1794	1931	2069	2207	2345	2483	2621	2759
14	28	42	56	69	83	97	111	125	**150**	1528	1667	1806	1944	2083	2222	2361	2500	2639	2778
.1	.2	.3	.4	.5	.6	.7	.8	.9		11	12	13	14	15	16	17	18	19	20

Corrections for tenths of width.										
0.1	1	1	1	1	1	1	2	2	2	2
0.2	2	2	2	3	3	3	3	3	4	4
0.3	3	3	4	4	4	4	5	5	5	6
0.4	4	4	5	5	6	6	6	7	7	7
0.5	5	6	6	6	7	7	8	8	9	9
0.6	6	7	7	8	8	9	9	10	11	11
0.7	7	8	8	9	10	10	11	12	12	13
0.8	8	9	10	10	11	12	13	13	14	15
0.9	9	10	11	12	12	13	14	15	16	17

Corrections for tenths of width.

.1	.2	.3	.4	.5	.6	.7	.8	.9	WIDTH	21	22	23	24	25	26	27	28	29	30
9	19	28	37	47	56	65	75	84	**101**	1964	2057	2151	2244	2338	2431	2525	2619	2712	2806
9	19	28	38	47	57	66	76	85	**102**	1983	2078	2172	2267	2361	2456	2550	2644	2739	2833
10	19	29	38	48	57	67	76	86	**103**	2003	2098	2194	2289	2384	2480	2575	2670	2766	2861
10	19	29	39	48	58	67	77	87	**104**	2022	2119	2215	2311	2407	2504	2600	2696	2793	2889
10	19	29	39	49	58	68	78	87	**105**	2042	2139	2236	2333	2431	2528	2625	2722	2819	2917
10	20	29	39	49	59	69	79	88	**106**	2061	2159	2257	2356	2454	2552	2650	2748	2846	2944
10	20	30	40	50	59	69	79	89	**107**	2081	2180	2279	2378	2477	2576	2675	2774	2873	2972
10	20	30	40	50	60	70	80	90	**108**	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000
10	20	30	40	50	61	71	81	91	**109**	2119	2220	2321	2422	2523	2624	2725	2826	2927	3028
10	20	31	41	51	61	71	82	92	**110**	2139	2241	2343	2444	2546	2648	2750	2852	2954	3056
10	21	31	41	51	62	72	82	92	**111**	2158	2261	2364	2467	2569	2672	2775	2878	2981	3083
10	21	31	41	52	62	73	83	93	**112**	2178	2281	2385	2489	2593	2696	2800	2904	3007	3111
10	21	31	42	52	63	73	84	94	**113**	2197	2302	2406	2511	2616	2720	2825	2930	3034	3139
11	21	32	42	53	63	74	84	95	**114**	2217	2322	2428	2533	2639	2744	2850	2956	3061	3167
11	21	32	43	53	64	75	85	96	**115**	2236	2343	2449	2556	2662	2769	2875	2981	3088	3194
11	21	32	43	54	64	75	86	97	**116**	2256	2363	2470	2578	2685	2793	2900	3007	3115	3222
11	22	33	43	54	65	76	87	98	**117**	2275	2383	2492	2600	2708	2817	2925	3033	3142	3250
11	22	33	44	55	66	76	87	98	**118**	2294	2404	2513	2622	2731	2841	2950	3059	3169	3278
11	22	33	44	55	66	77	88	99	**119**	2314	2424	2534	2644	2755	2865	2975	3085	3195	3306
11	22	33	44	56	67	78	89	100	**120**	2333	2444	2556	2667	2778	2889	3000	3111	3222	3333
11	22	34	45	56	67	78	90	101	**121**	2353	2465	2577	2689	2801	2913	3025	3137	3249	3361
11	23	34	45	56	68	79	90	102	**122**	2372	2485	2598	2711	2824	2937	3050	3163	3276	3389
11	23	34	46	57	68	80	91	102	**123**	2392	2506	2619	2733	2847	2961	3075	3189	3303	3417
11	23	34	46	57	69	80	92	103	**124**	2411	2526	2641	2756	2870	2985	3100	3215	3330	3444
12	23	35	46	58	69	81	93	104	**125**	2431	2546	2662	2778	2894	3009	3125	3241	3356	3472
12	23	35	47	58	70	82	93	105	**126**	2450	2567	2683	2800	2917	3033	3150	3267	3383	3500
12	24	35	47	59	71	82	94	106	**127**	2469	2587	2705	2822	2940	3057	3175	3293	3410	3528
12	24	36	47	59	71	83	95	107	**128**	2489	2607	2726	2844	2963	3081	3200	3319	3437	3556
12	24	36	48	60	72	84	96	107	**129**	2508	2628	2747	2867	2986	3106	3225	3344	3464	3583
12	24	36	48	60	72	84	96	108	**130**	2528	2648	2769	2889	3009	3130	3250	3370	3491	3611
12	24	36	49	61	73	85	97	109	**131**	2547	2669	2790	2911	3032	3154	3275	3396	3518	3639
12	24	37	49	61	73	86	98	110	**132**	2567	2689	2811	2933	3056	3178	3300	3422	3544	3667
12	25	37	49	62	74	86	99	111	**133**	2586	2709	2832	2956	3079	3202	3325	3448	3571	3694
12	25	37	50	62	74	87	99	112	**134**	2606	2730	2854	2978	3102	3226	3350	3474	3598	3722
13	25	38	50	63	75	88	100	113	**135**	2625	2750	2875	3000	3125	3250	3375	3500	3625	3750
13	25	38	50	63	76	88	100	113	**136**	2644	2770	2896	3022	3148	3274	3400	3526	3652	3778
13	25	38	51	63	76	89	101	114	**137**	2664	2791	2918	3044	3171	3298	3425	3552	3679	3806
13	26	38	51	64	77	89	102	115	**138**	2683	2811	2939	3067	3194	3322	3450	3578	3706	3833
13	26	39	51	64	77	90	103	116	**139**	2703	2831	2960	3089	3218	3346	3475	3604	3732	3861
13	26	39	52	65	78	91	104	117	**140**	2722	2852	2981	3111	3241	3370	3500	3630	3759	3889
13	26	39	52	65	78	91	104	117	**141**	2742	2872	3003	3133	3264	3394	3525	3656	3786	3917
13	26	39	53	66	79	92	105	118	**142**	2761	2893	3024	3156	3287	3419	3550	3681	3813	3944
13	26	40	53	66	79	93	106	119	**143**	2781	2913	3045	3178	3310	3443	3575	3707	3840	3972
13	27	40	53	67	80	93	107	120	**144**	2800	2933	3067	3200	3333	3467	3600	3733	3867	4000
13	27	40	54	67	81	94	107	121	**145**	2819	2954	3088	3222	3356	3491	3625	3759	3894	4028
14	27	41	54	68	81	95	108	122	**146**	2839	2974	3109	3244	3380	3515	3650	3785	3920	4056
14	27	41	54	68	82	95	109	122	**147**	2858	2994	3131	3267	3403	3539	3675	3811	3947	4083
14	27	41	55	69	82	96	110	123	**148**	2878	3015	3152	3289	3426	3563	3700	3837	3974	4111
14	28	41	55	69	83	97	110	124	**149**	2897	3035	3173	3311	3449	3587	3725	3863	4001	4139
14	28	42	56	69	83	97	111	125	**150**	2917	3056	3194	3333	3472	3611	3750	3889	4028	4167
.1	.2	.3	.4	.5	.6	.7	.8	.9		21	22	23	24	25	26	27	28	29	30

Corrections for tenths of width.										
0.1	2	2	2	2	2	2	2	3	3	3
0.2	4	4	4	4	5	5	5	5	5	6
0.3	6	6	6	7	7	7	7	8	8	8
0.4	8	8	9	9	9	10	10	10	11	11
0.5	10	10	11	11	12	12	12	13	13	14
0.6	12	12	13	13	14	14	15	16	16	17
0.7	14	14	15	16	16	17	17	18	19	19
0.8	16	16	17	18	19	19	20	21	21	22
0.9	17	18	19	20	21	22	22	23	24	25

Corrections for tenths of height.

.1	.2	.3	.4	.5	.6	.7	.8	.9	WIDTH	31	32	33	34	35	36	37	38	39	40
9	19	28	37	47	56	65	75	84	**101**	2899	2993	3086	3180	3273	3367	3460	3554	3647	3741
9	19	28	38	47	57	66	76	85	**102**	2928	3022	3117	3211	3306	3400	3494	3589	3683	3778
10	19	29	38	48	57	67	76	86	**103**	2956	3052	3147	3243	3338	3433	3529	3624	3719	3815
10	19	29	39	48	58	67	77	87	**104**	2985	3081	3178	3274	3370	3467	3563	3659	3756	3852
10	19	29	39	49	58	68	78	87	**105**	3014	3111	3208	3306	3403	3500	3597	3694	3792	3889
10	20	29	39	49	59	69	79	88	**106**	3043	3141	3239	3337	3435	3533	3631	3730	3828	3926
10	20	30	40	50	59	69	79	89	**107**	3071	3170	3269	3369	3468	3567	3666	3765	3864	3963
10	20	30	40	50	60	70	80	90	**108**	3100	3200	3300	3400	3500	3600	3700	3800	3900	4000
10	20	30	40	50	61	71	81	91	**109**	3129	3230	3331	3431	3532	3633	3734	3835	3936	4037
10	20	31	41	51	61	71	81	92	**110**	3157	3259	3361	3463	3565	3667	3769	3870	3972	4074
10	21	31	41	51	62	72	82	92	**111**	3186	3289	3392	3494	3597	3700	3803	3906	4008	4111
10	21	31	41	52	62	73	83	93	**112**	3215	3319	3422	3526	3630	3733	3837	3941	4044	4148
10	21	31	42	52	63	73	84	94	**113**	3244	3348	3453	3557	3662	3767	3871	3976	4081	4185
11	21	32	42	53	63	74	84	95	**114**	3272	3378	3483	3589	3694	3800	3906	4011	4117	4222
11	21	32	43	53	64	75	85	96	**115**	3301	3407	3514	3620	3727	3833	3940	4046	4153	4259
11	21	32	43	54	64	75	86	97	**116**	3330	3437	3544	3652	3759	3867	3974	4081	4189	4296
11	22	33	43	54	65	76	87	97	**117**	3358	3467	3575	3683	3792	3900	4008	4117	4225	4333
11	22	33	44	55	66	76	87	98	**118**	3387	3496	3606	3715	3824	3933	4043	4152	4261	4370
11	22	33	44	55	66	77	88	99	**119**	3416	3526	3636	3746	3856	3967	4077	4187	4297	4407
11	22	33	44	56	67	78	89	100	**120**	3444	3556	3667	3778	3889	4000	4111	4222	4333	4444
11	22	34	45	56	67	78	90	101	**121**	3473	3585	3697	3809	3921	4033	4145	4257	4369	4481
11	23	34	45	56	68	79	90	102	**122**	3502	3615	3728	3841	3954	4067	4180	4293	4406	4519
11	23	34	46	57	68	80	91	102	**123**	3531	3644	3758	3872	3986	4100	4214	4328	4442	4556
11	23	34	46	57	69	80	92	103	**124**	3559	3674	3789	3904	4019	4133	4248	4363	4478	4593
12	23	35	46	58	69	81	93	104	**125**	3588	3704	3819	3935	4051	4167	4282	4398	4514	4630
12	23	35	47	58	70	82	93	105	**126**	3617	3733	3850	3967	4083	4200	4317	4433	4550	4667
12	24	35	47	59	71	82	94	106	**127**	3645	3763	3881	3998	4116	4233	4351	4469	4586	4704
12	24	36	47	59	71	83	95	107	**128**	3674	3793	3911	4030	4148	4267	4385	4504	4622	4741
12	24	36	48	60	72	84	96	107	**129**	3703	3822	3942	4061	4181	4300	4419	4539	4658	4778
12	24	36	48	60	72	84	96	108	**130**	3731	3852	3972	4093	4213	4333	4454	4574	4694	4815
12	24	36	49	61	73	85	97	109	**131**	3760	3881	4003	4124	4245	4367	4488	4609	4731	4852
12	24	37	49	61	73	86	98	110	**132**	3789	3911	4033	4156	4278	4400	4522	4644	4767	4889
12	25	37	49	62	74	86	99	111	**133**	3818	3941	4064	4187	4310	4433	4556	4680	4803	4926
12	25	37	50	62	74	87	99	112	**134**	3846	3970	4094	4219	4343	4467	4591	4715	4839	4963
12	25	37	50	62	75	87	100	112	**135**	3875	4000	4125	4250	4375	4500	4625	4750	4875	5000
13	25	38	50	63	76	88	101	113	**136**	3904	4030	4156	4281	4407	4533	4659	4785	4911	5037
13	25	38	51	63	76	89	101	114	**137**	3932	4059	4186	4313	4440	4567	4694	4820	4947	5074
13	26	38	51	64	77	89	102	115	**138**	3961	4089	4217	4344	4472	4600	4728	4856	4983	5111
13	26	39	51	64	77	90	103	116	**139**	3990	4119	4247	4376	4505	4633	4762	4891	5019	5148
13	26	39	52	65	78	91	104	117	**140**	4019	4148	4278	4407	4537	4667	4796	4926	5056	5185
13	26	39	52	65	78	91	104	118	**141**	4047	4178	4308	4439	4569	4700	4831	4961	5092	5222
13	26	39	53	66	79	92	105	118	**142**	4076	4207	4339	4470	4602	4733	4865	4996	5128	5259
13	26	40	53	66	79	93	106	119	**143**	4105	4237	4369	4502	4634	4767	4899	5031	5164	5296
13	27	40	53	67	80	93	107	120	**144**	4133	4267	4400	4533	4667	4800	4933	5067	5200	5333
13	27	40	54	67	81	94	107	121	**145**	4162	4296	4431	4565	4699	4833	4968	5102	5236	5370
14	27	41	54	68	81	95	108	122	**146**	4191	4326	4461	4596	4731	4867	5002	5137	5272	5407
14	27	41	54	68	82	95	109	123	**147**	4219	4356	4492	4628	4764	4900	5036	5172	5308	5444
14	27	41	55	69	82	96	110	123	**148**	4248	4385	4522	4659	4796	4933	5070	5207	5344	5481
14	28	41	55	69	83	97	110	124	**149**	4277	4415	4553	4691	4829	4967	5105	5243	5381	5519
14	28	42	56	69	83	97	111	125	**150**	4306	4444	4583	4722	4861	5000	5139	5278	5417	5556
.1	.2	.3	.4	.5	.6	.7	.8	.9		31	32	33	34	35	36	37	38	39	40

Corrections for tenths of width.										
0.1	3	3	3	3	3	3	3	4	4	4
0.2	6	6	6	6	6	7	7	7	7	7
0.3	9	9	9	9	10	10	10	11	11	11
0.4	11	12	12	13	13	13	14	14	14	15
0.5	14	15	15	16	16	17	17	18	18	19
0.6	17	18	18	19	19	20	21	21	22	22
0.7	20	21	21	22	23	23	24	25	25	26
0.8	23	24	24	25	26	27	27	28	29	30
0.9	26	27	28	28	29	30	31	32	32	33

Corrections for tenths of height.

.1	.2	.3	.4	.5	.6	.7	.8	.9	WIDTH	41	42	43	44	45	46	47	48	49	50
9	19	28	37	47	56	65	75	84	**101**	3834	3928	4021	4115	4208	4302	4395	4489	4582	4676
9	19	28	38	47	57	66	76	85	**102**	3872	3967	4061	4156	4250	4344	4439	4533	4628	4722
10	19	29	38	48	57	67	76	86	**103**	3910	4006	4101	4196	4292	4387	4482	4578	4673	4769
10	19	29	39	48	58	67	77	87	**104**	3948	4044	4141	4237	4333	4430	4526	4622	4719	4815
10	19	29	39	49	58	68	78	87	**105**	3986	4083	4181	4278	4375	4472	4569	4667	4764	4861
10	20	29	39	49	59	69	79	88	**106**	4024	4122	4220	4319	4417	4515	4613	4711	4809	4907
10	20	30	40	50	59	69	79	89	**107**	4062	4161	4260	4359	4458	4557	4656	4756	4855	4954
10	20	30	40	50	60	70	80	90	**108**	4100	4200	4300	4400	4500	4600	4700	4800	4900	5000
10	20	30	40	50	61	71	81	91	**109**	4138	4239	4340	4441	4542	4643	4744	4844	4945	5046
10	20	31	41	51	61	71	81	92	**110**	4176	4278	4380	4481	4583	4685	4787	4889	4991	5093
10	21	31	41	51	62	72	82	92	**111**	4214	4317	4419	4522	4625	4728	4831	4933	5036	5139
10	21	31	41	52	62	73	83	93	**112**	4252	4356	4459	4563	4667	4770	4874	4978	5081	5185
10	21	31	42	52	63	73	84	94	**113**	4290	4394	4499	4604	4708	4813	4918	5022	5127	5231
11	21	32	42	53	63	74	84	95	**114**	4328	4433	4539	4644	4750	4856	4961	5067	5172	5278
11	21	32	43	53	64	75	85	96	**115**	4366	4472	4579	4685	4792	4898	5005	5111	5218	5324
11	21	32	43	54	64	75	86	97	**116**	4404	4511	4619	4726	4833	4941	5048	5156	5263	5370
11	22	32	43	54	65	76	87	97	**117**	4442	4550	4658	4767	4875	4983	5092	5200	5308	5417
11	22	33	44	55	66	76	87	98	**118**	4480	4589	4698	4807	4917	5026	5135	5244	5354	5463
11	22	33	44	55	66	77	88	99	**119**	4518	4628	4738	4848	4958	5069	5179	5289	5399	5509
11	22	33	44	56	67	78	89	100	**120**	4556	4667	4778	4889	5000	5111	5222	5333	5444	5556
11	22	34	45	56	67	78	90	101	**121**	4594	4706	4818	4930	5042	5154	5266	5378	5490	5602
11	23	34	45	56	68	79	90	102	**122**	4631	4744	4857	4970	5083	5196	5309	5422	5535	5648
11	23	34	46	57	68	80	91	102	**123**	4669	4783	4897	5011	5125	5239	5353	5467	5581	5694
11	23	34	46	57	69	80	92	103	**124**	4707	4822	4937	5052	5167	5281	5396	5511	5626	5741
12	23	35	46	58	69	81	93	104	**125**	4745	4861	4977	5093	5208	5324	5440	5556	5671	5787
12	23	35	47	58	70	82	93	105	**126**	4783	4900	5017	5133	5250	5367	5483	5600	5717	5833
12	24	35	47	59	71	82	94	106	**127**	4821	4939	5056	5174	5292	5409	5527	5644	5762	5880
12	24	36	47	59	71	83	95	107	**128**	4859	4978	5096	5215	5333	5452	5570	5689	5807	5926
12	24	36	48	60	72	84	96	107	**129**	4897	5017	5136	5256	5375	5494	5614	5733	5853	5972
12	24	36	48	60	72	84	96	108	**130**	4935	5056	5176	5296	5417	5537	5657	5778	5898	6019
12	24	36	49	61	73	85	97	109	**131**	4973	5094	5216	5337	5458	5580	5701	5822	5944	6065
12	24	37	49	61	73	86	98	110	**132**	5011	5133	5256	5378	5500	5622	5744	5867	5989	6111
12	25	37	49	62	74	86	99	111	**133**	5049	5172	5295	5419	5542	5665	5788	5911	6034	6157
12	25	37	50	62	74	87	99	112	**134**	5087	5211	5335	5459	5583	5707	5831	5956	6080	6204
12	25	37	50	62	75	87	100	112	**135**	5125	5250	5375	5500	5625	5750	5875	6000	6125	6250
13	25	38	50	63	76	88	100	113	**136**	5163	5289	5415	5541	5667	5793	5919	6044	6170	6296
13	25	38	51	63	76	89	101	114	**137**	5201	5328	5455	5581	5708	5835	5962	6089	6216	6343
13	26	38	51	64	77	89	102	115	**138**	5239	5367	5494	5622	5750	5878	6006	6133	6261	6389
13	26	39	51	64	77	90	103	116	**139**	5277	5406	5534	5663	5792	5920	6049	6178	6306	6435
13	26	39	52	65	78	91	104	117	**140**	5315	5444	5574	5704	5833	5963	6093	6222	6352	6481
13	26	39	52	65	78	91	104	118	**141**	5353	5483	5614	5744	5875	6006	6136	6267	6397	6528
13	26	39	53	66	79	92	105	118	**142**	5391	5522	5654	5785	5917	6048	6180	6311	6443	6574
13	26	40	53	66	79	93	106	119	**143**	5429	5561	5694	5826	5958	6091	6223	6356	6488	6620
13	27	40	53	67	80	93	107	120	**144**	5467	5600	5733	5867	6000	6133	6267	6400	6533	6667
13	27	40	54	67	81	94	107	121	**145**	5505	5639	5773	5907	6042	6176	6310	6444	6579	6713
14	27	41	54	68	81	95	108	122	**146**	5543	5678	5813	5948	6083	6219	6354	6489	6624	6759
14	27	41	54	68	82	95	109	122	**147**	5581	5717	5853	5989	6125	6261	6397	6533	6669	6806
14	27	41	55	69	82	96	110	123	**148**	5619	5756	5893	6030	6167	6304	6441	6578	6715	6852
14	28	41	55	69	83	97	110	124	**149**	5656	5794	5932	6070	6208	6346	6484	6622	6760	6898
14	28	42	56	69	83	97	111	125	**150**	5694	5833	5972	6111	6250	6389	6528	6667	6806	6944
.1	.2	.3	.4	.5	.6	.7	.8	.9		41	42	43	44	45	46	47	48	49	50

Corrections for tenths of width.										
0.1	4	4	4	4	4	4	4	4	5	5
0.2	8	8	8	8	8	9	9	9	9	9
0.3	11	12	12	12	12	13	13	13	14	14
0.4	15	16	16	16	17	17	17	18	18	19
0.5	19	19	20	20	21	21	22	22	23	23
0.6	23	23	24	24	25	26	26	27	27	28
0.7	27	27	28	29	29	30	30	31	32	32
0.8	30	31	32	33	33	34	35	36	36	37
0.9	34	35	36	37	37	38	39	40	41	42

Corrections for tenths of height.

.1	.2	.3	.4	.5	.6	.7	.8	.9	WIDTH	51	52	53	54	55	56	57	58	59	60
9	19	28	37	47	56	65	75	84	**101**	4769	4863	4956	5050	5144	5237	5331	5424	5518	5611
9	19	28	38	47	57	66	76	85	**102**	4817	4911	5006	5100	5194	5289	5383	5478	5572	5667
10	19	29	38	48	57	67	76	86	**103**	4864	4959	5055	5150	5245	5341	5436	5531	5627	5722
10	19	29	39	48	58	67	77	87	**104**	4911	5007	5104	5200	5296	5393	5489	5585	5681	5778
10	19	29	39	49	58	68	78	87	**105**	4958	5056	5153	5250	5347	5444	5542	5639	5736	5833
10	20	29	39	49	59	69	79	88	**106**	5006	5104	5202	5300	5398	5496	5594	5693	5791	5889
10	20	30	40	50	59	69	79	89	**107**	5053	5152	5251	5350	5449	5548	5647	5746	5845	5944
10	20	30	40	50	60	70	80	90	**108**	5100	5200	5300	5400	5500	5600	5700	5800	5900	6000
10	20	30	40	50	61	71	81	91	**109**	5147	5248	5349	5450	5551	5652	5753	5854	5955	6056
10	20	31	41	51	61	71	81	92	**110**	5194	5296	5398	5500	5602	5704	5806	5907	6009	6111
10	21	31	41	51	62	72	82	92	**111**	5242	5344	5447	5550	5653	5756	5858	5961	6064	6167
10	21	31	41	52	62	73	83	93	**112**	5289	5393	5496	5600	5704	5807	5911	6015	6119	6222
10	21	31	42	52	63	73	84	94	**113**	5336	5441	5545	5650	5755	5859	5964	6069	6173	6278
11	21	32	42	53	63	74	84	95	**114**	5383	5489	5594	5700	5806	5911	6017	6122	6228	6333
11	21	32	43	53	64	75	85	96	**115**	5431	5537	5644	5750	5856	5963	6069	6176	6282	6389
11	21	32	43	54	64	75	86	97	**116**	5478	5585	5693	5800	5907	6015	6122	6230	6337	6444
11	22	32	43	54	65	76	87	97	**117**	5525	5633	5742	5850	5958	6067	6175	6283	6392	6500
11	22	33	44	55	66	76	87	98	**118**	5572	5681	5791	5900	6009	6119	6228	6337	6446	6556
11	22	33	44	55	66	77	88	99	**119**	5619	5730	5840	5950	6060	6170	6281	6391	6501	6611
11	22	33	44	56	67	78	89	100	**120**	5667	5778	5889	6000	6111	6222	6333	6444	6556	6667
11	22	34	45	56	67	78	90	101	**121**	5714	5826	5938	6050	6162	6274	6386	6498	6610	6722
11	23	34	45	56	68	79	90	102	**122**	5761	5874	5987	6100	6213	6326	6439	6552	6665	6778
11	23	34	46	57	68	80	91	102	**123**	5808	5922	6036	6150	6264	6378	6492	6606	6719	6833
11	23	34	46	57	69	80	92	103	**124**	5856	5970	6085	6200	6315	6430	6544	6659	6774	6889
12	23	35	46	58	69	81	93	104	**125**	5903	6019	6134	6250	6366	6481	6597	6713	6829	6944
12	23	35	47	58	70	82	93	105	**126**	5950	6067	6183	6300	6417	6533	6650	6767	6883	7000
12	24	35	47	59	71	82	94	106	**127**	5997	6115	6232	6350	6468	6585	6703	6820	6938	7056
12	24	36	47	59	71	83	95	107	**128**	6044	6163	6281	6400	6519	6637	6756	6874	6993	7111
12	24	36	48	60	72	84	96	107	**129**	6092	6211	6331	6450	6569	6689	6808	6928	7047	7167
12	24	36	48	60	72	84	96	108	**130**	6139	6259	6380	6500	6620	6741	6861	6981	7102	7222
12	24	36	49	61	73	85	97	109	**131**	6186	6307	6429	6550	6671	6793	6914	7035	7156	7278
12	24	37	49	61	73	86	98	110	**132**	6233	6356	6478	6600	6722	6844	6967	7089	7211	7333
12	25	37	49	62	74	86	99	111	**133**	6281	6404	6527	6650	6773	6896	7019	7143	7266	7389
12	25	37	50	62	74	87	99	112	**134**	6328	6452	6576	6700	6824	6948	7072	7196	7320	7444
12	25	37	50	62	75	87	100	112	**135**	6375	6500	6625	6750	6875	7000	7125	7250	7375	7500
13	25	38	50	63	76	88	101	113	**136**	6422	6548	6674	6800	6926	7052	7178	7304	7430	7556
13	25	38	51	63	76	89	101	114	**137**	6469	6596	6723	6850	6977	7104	7231	7357	7484	7611
13	26	38	51	64	77	89	102	115	**138**	6517	6644	6772	6900	7028	7156	7283	7411	7539	7667
13	26	39	51	64	77	90	103	116	**139**	6564	6693	6821	6950	7079	7207	7336	7465	7594	7722
13	26	39	52	65	78	91	104	117	**140**	6611	6741	6870	7000	7130	7259	7389	7519	7648	7778
13	26	39	52	65	78	91	104	117	**141**	6658	6789	6919	7050	7181	7311	7442	7572	7703	7833
13	26	39	53	66	79	92	105	118	**142**	6706	6837	6969	7100	7231	7363	7494	7626	7757	7889
13	26	40	53	66	79	93	106	119	**143**	6753	6885	7018	7150	7282	7415	7547	7680	7812	7944
13	27	40	53	67	80	93	107	120	**144**	6800	6933	7067	7200	7333	7467	7600	7733	7867	8000
13	27	40	54	67	81	94	107	121	**145**	6847	6981	7116	7250	7384	7519	7653	7787	7921	8056
14	27	41	54	68	81	95	108	122	**146**	6894	7030	7165	7300	7435	7570	7706	7841	7976	8111
14	27	41	54	68	82	95	109	122	**147**	6942	7078	7214	7350	7486	7622	7758	7894	8031	8167
14	27	41	55	69	82	96	110	123	**148**	6989	7126	7263	7400	7537	7674	7811	7948	8085	8222
14	27	41	55	69	83	97	110	124	**149**	7036	7174	7312	7450	7588	7726	7864	8002	8140	8278
14	28	42	56	69	83	97	111	125	**150**	7083	7222	7361	7500	7639	7778	7917	8056	8194	8333
.1	.2	.3	.4	.5	.6	.7	.8	.9		51	52	53	54	55	56	57	58	59	60

Corrections for tenths of width.										
0.1	5	5	5	5	5	5	5	5	5	6
0.2	9	10	10	10	10	10	11	11	11	11
0.3	14	14	15	15	15	16	16	16	16	17
0.4	19	19	20	20	20	21	21	21	22	22
0.5	24	24	25	25	25	26	26	27	27	28
0.6	28	29	29	30	31	31	32	32	33	33
0.7	33	34	34	35	36	36	37	38	38	39
0.8	38	39	39	40	41	41	42	43	44	44
0.9	42	43	44	45	46	47	47	48	49	50

TABLE

OF

PRISMOIDAL CORRECTIONS FOR TRIANGULAR PRISMOIDS FOR RAILWAY EARTHWORK

IN CUBIC YARDS

To be applied to the approximate volume found by averaging end areas

.1	.2	.3	.4	.5	.6	.7	.8	.9	w′—w.	1	2	3	4	5	6	7	8	9	10
									1		1	1	1	2	2	2	2	3	3
								1	**2**	1	1	2	2	3	4	4	5	6	6
					1	1	1	1	**3**	1	2	3	4	5	6	6	7	8	9
				1	1	1	1	1	**4**	1	2	4	5	6	7	9	10	11	12
			1	1	1	1	1	1	**5**	2	3	5	6	8	9	11	12	14	15
		1	1	1	1	1	1	2	**6**	2	4	6	7	9	11	13	15	17	19
		1	1	1	1	2	2	2	**7**	2	4	6	9	11	13	15	17	19	22
		1	1	1	1	2	2	2	**8**	2	5	7	10	12	15	17	20	22	25
	1	1	1	1	2	2	2	2	**9**	3	6	8	11	14	17	19	22	25	28
	1	1	1	2	2	2	2	3	**10**	3	6	9	12	15	19	22	25	28	31
	1	1	1	2	2	2	3	3	**11**	3	7	10	14	17	20	24	27	31	34
	1	1	1	2	2	3	3	3	**12**	4	7	11	15	19	22	26	30	33	37
	1	1	2	2	2	3	3	4	**13**	4	8	12	16	20	24	28	32	36	40
	1	1	2	2	3	3	3	4	**14**	4	9	13	17	22	26	30	35	39	43
	1	1	2	2	3	3	4	4	**15**	5	9	14	19	23	28	32	37	42	46
	1	1	2	2	3	3	4	4	**16**	5	10	15	20	25	30	35	40	44	49
1	1	2	2	3	3	4	4	5	**17**	5	10	16	21	26	31	37	42	47	52
1	1	2	2	3	3	4	4	5	**18**	6	11	17	22	28	33	39	44	50	56
1	1	2	2	3	4	4	5	5	**19**	6	12	18	23	29	35	41	47	53	59
1	1	2	2	3	4	4	5	6	**20**	6	12	19	25	31	37	43	49	56	62
1	1	2	3	3	4	5	5	6	**21**	6	13	19	26	32	39	45	52	58	65
1	1	2	3	3	4	5	5	6	**22**	7	14	20	27	34	41	48	54	61	68
1	1	2	3	4	4	5	6	6	**23**	7	14	21	28	35	43	50	57	64	71
1	1	2	3	4	4	5	6	7	**24**	7	15	22	30	37	44	52	59	67	74
1	2	2	3	4	5	5	6	7	**25**	8	15	23	31	39	46	54	62	69	77
1	2	2	3	4	5	6	6	7	**26**	8	16	24	32	40	48	56	64	72	80
1	2	3	3	4	5	6	7	8	**27**	8	17	25	33	42	50	58	67	75	83
1	2	3	3	4	5	6	7	8	**28**	9	17	26	35	43	52	60	69	78	86
1	2	3	4	4	5	6	7	8	**29**	9	18	27	36	45	54	63	72	81	90
1	2	3	4	5	6	6	7	8	**30**	9	19	28	37	46	56	65	74	83	93
1	2	3	4	5	6	7	8	9	**31**	10	19	29	38	48	57	67	77	86	96
1	2	3	4	5	6	7	8	9	**32**	10	20	30	40	49	59	69	79	89	99
1	2	3	4	5	6	7	8	9	**33**	10	20	31	41	51	61	71	81	92	102
1	2	3	4	5	6	7	8	9	**34**	10	21	31	42	52	63	73	84	94	105
1	2	3	4	5	6	8	9	10	**35**	11	22	32	43	54	65	76	86	97	108
1	2	3	4	6	7	8	9	10	**36**	11	22	33	44	56	67	78	89	100	111
1	2	3	5	6	7	8	9	10	**37**	11	23	34	46	57	69	80	91	103	114
1	2	4	5	6	7	8	9	11	**38**	12	23	35	47	59	70	82	94	106	117
1	2	4	5	6	7	8	10	11	**39**	12	24	36	48	60	72	84	96	108	120
1	2	4	5	6	7	9	10	11	**40**	12	25	37	49	62	74	86	99	111	123
1	3	4	5	6	8	9	10	11	**41**	13	25	38	51	63	76	89	101	114	127
1	3	4	5	6	8	9	10	12	**42**	13	26	39	52	65	78	91	104	117	130
1	3	4	5	7	8	9	11	12	**43**	13	27	40	53	66	80	93	106	119	133
1	3	4	5	7	8	10	11	12	**44**	14	27	41	54	68	81	95	109	122	136
1	3	4	6	7	8	10	11	12	**45**	14	28	42	56	69	83	97	111	125	139
1	3	4	6	7	9	10	11	13	**46**	14	28	43	57	71	85	99	114	128	142
1	3	4	6	7	9	10	12	13	**47**	15	29	44	58	73	87	102	116	131	145
1	3	4	6	7	9	10	12	13	**48**	15	30	44	59	74	89	104	119	133	148
2	3	5	6	8	9	11	12	14	**49**	15	30	45	60	76	91	106	121	136	151
2	3	5	6	8	9	11	12	14	**50**	15	31	46	62	77	93	108	123	139	154
.1	.2	.3	.4	.5	.6	.7	.8	.9		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**

Corrections for tenths of width′—width.										
0.1										
0.2									1	1
0.3						1	1	1	1	1
0.4					1	1	1	1	1	1
0.5				1	1	1	1	1	1	2
0.6			1	1	1	1	1	1	2	2
0.7			1	1	1	1	2	2	2	2
0.8			1	1	1	1	2	2	2	2
0.9		1	1	1	1	2	2	2	2	3

Corrections for tenths of height—height′.

.1	.2	.3	.4	.5	.6	.7	.8	.9	w′—w.	11	12	13	14	15	16	17	18	19	20
									1	3	4	4	4	5	5	5	6	6	6
								1	**2**	7	7	8	9	9	10	10	11	12	12
						1	1	1	**3**	10	11	12	13	14	15	16	17	18	19
					1	1	1	1	**4**	14	15	16	17	19	20	21	22	23	25
				1	1	1	1	1	**5**	17	19	20	22	23	25	26	28	29	31
			1	1	1	1	1	2	**6**	20	22	24	26	28	30	31	33	35	37
			1	1	1	1	2	2	**7**	24	26	28	30	32	35	37	39	41	43
			1	1	1	1	2	2	**8**	27	30	32	35	37	40	42	44	47	49
		1	1	1	1	2	2	2	**9**	31	33	36	39	42	44	47	50	53	56
		1	1	1	2	2	2	2	**10**	34	37	40	43	46	49	52	56	59	62
		1	1	1	2	2	2	3	**11**	37	41	44	48	51	54	58	61	65	68
		1	1	1	2	2	3	3	**12**	41	44	48	52	56	59	63	67	70	74
		1	1	2	2	2	3	3	**13**	44	48	52	56	60	64	68	72	76	80
		1	1	2	2	3	3	3	**14**	48	52	56	60	65	69	73	78	82	86
		1	1	2	2	3	3	4	**15**	51	56	60	65	69	74	79	83	88	93
	1	1	2	3	3	3	4	4	**16**	54	59	64	69	74	79	84	89	94	99
1	1	2	2	3	3	4	4	5	**17**	58	63	68	73	79	84	89	94	100	105
1	1	2	2	3	3	4	4	5	**18**	61	67	72	78	83	89	94	100	106	111
1	1	2	2	3	4	4	5	5	**19**	65	70	76	82	88	94	100	106	111	117
1	1	2	2	3	4	4	5	6	**20**	68	74	80	86	93	99	105	111	117	123
1	1	2	3	3	4	5	5	6	**21**	71	78	84	91	97	104	110	117	123	130
1	1	2	3	3	4	5	5	6	**22**	75	81	88	95	102	109	115	122	129	136
1	1	2	3	4	4	5	6	6	**23**	78	85	92	99	106	114	121	128	135	142
1	1	2	3	4	4	5	6	7	**24**	81	89	96	104	111	119	126	133	141	148
1	2	2	3	4	5	5	6	7	**25**	85	93	100	108	116	123	131	139	147	154
1	2	2	3	4	5	6	6	7	**26**	88	96	104	112	120	128	136	144	152	160
1	2	3	3	4	5	6	7	8	**27**	92	100	108	117	125	133	142	150	158	167
1	2	3	3	4	5	6	7	8	**28**	95	104	112	121	130	138	147	156	164	173
1	2	3	4	4	5	6	7	8	**29**	98	107	116	125	134	143	152	161	170	179
1	2	3	4	5	6	6	7	8	**30**	102	111	120	130	139	148	157	167	176	185
1	2	3	4	5	6	7	8	9	**31**	105	115	124	134	144	153	163	172	182	191
1	2	3	4	5	6	7	8	9	**32**	109	119	128	138	148	158	168	178	188	198
1	2	3	4	5	6	7	8	9	**33**	112	122	132	143	153	163	173	183	194	204
1	2	3	4	5	6	7	8	9	**34**	115	126	136	147	157	168	178	189	199	210
1	2	3	4	5	6	8	9	10	**35**	119	130	140	151	162	173	184	194	205	216
1	2	3	4	6	7	8	9	10	**36**	122	133	144	156	167	178	189	200	211	222
1	2	3	5	6	7	8	9	10	**37**	126	137	148	160	171	183	194	206	217	228
1	2	4	5	6	7	8	9	11	**38**	129	141	152	164	176	188	199	211	223	235
1	2	4	5	6	7	8	10	11	**39**	132	144	156	169	181	193	205	217	229	241
1	2	4	5	6	7	9	10	11	**40**	136	148	160	173	185	198	210	222	235	247
1	3	4	5	6	8	9	10	11	**41**	139	152	165	177	190	202	215	228	240	253
1	3	4	5	6	8	9	10	12	**42**	143	156	169	181	194	207	220	233	246	259
1	3	4	5	7	8	9	11	12	**43**	146	159	173	186	199	212	226	239	252	265
1	3	4	5	7	8	10	11	12	**44**	149	163	177	190	204	217	231	244	258	272
1	3	4	6	7	8	10	11	12	**45**	153	167	181	194	208	222	236	250	264	278
1	3	4	6	7	9	10	11	13	**46**	156	170	185	199	213	227	241	256	270	284
1	3	4	6	7	9	10	12	13	**47**	160	174	189	203	218	232	247	261	276	290
1	3	4	6	7	9	10	12	13	**48**	163	178	193	207	222	237	252	267	281	296
2	3	5	6	8	9	11	12	14	**49**	166	181	197	212	227	242	257	272	287	302
2	3	5	6	8	9	11	12	14	**50**	170	185	201	216	231	247	262	278	293	309
.1	.2	.3	.4	.5	.6	.7	.8	.9		11	12	13	14	15	16	17	18	19	20

Corrections for tenths of width′—width.

0.1							1	1	1	1
0.2	1	1	1	1	1	1	1	1	1	1
0.3	1	1	1	1	1	1	2	2	2	2
0.4	1	1	2	2	2	2	2	2	2	2
0.5	2	2	2	2	2	2	3	3	3	3
0.6	2	2	2	3	3	3	3	3	4	4
0.7	2	3	3	3	3	3	4	4	4	4
0.8	3	3	3	3	4	4	4	4	5	5
0.9	3	3	4	4	4	4	5	5	5	6

Corrections for tenths of height—height′.

.1	.2	.3	.4	.5	.6	.7	.8	.9	w′—w.	21	22	23	24	25	26	27	28	29	30
								1	1	6	7	7	7	8	8	8	9	9	9
							1	1	2	13	14	14	15	15	16	17	17	18	19
						1	1	1	3	19	20	21	22	23	24	25	26	27	28
					1	1	1	1	4	26	27	28	30	31	32	33	35	36	37
				1	1	1	1	1	5	32	34	35	37	39	40	42	43	45	46
			1	1	1	1	1	2	6	39	41	43	44	46	48	50	52	54	56
			1	1	1	1	2	2	7	45	48	50	52	54	56	58	60	63	65
			1	1	1	1	2	2	8	52	54	57	59	62	64	67	69	72	74
		1	1	1	1	2	2	2	9	58	61	64	67	69	72	75	78	81	83
		1	1	1	2	2	2	2	10	65	68	71	74	77	80	83	86	90	93
		1	1	1	2	2	2	3	11	71	75	78	81	85	88	92	95	98	102
		1	1	1	2	2	3	3	12	78	81	85	89	93	96	100	104	107	111
		1	1	2	2	3	3	4	13	84	88	92	96	100	104	108	112	116	120
		1	1	2	2	3	3	4	14	91	95	99	104	108	112	117	121	125	130
		1	1	2	2	3	3	4	15	97	102	106	111	116	120	125	130	134	139
		1	1	2	3	3	3	4	16	104	109	114	119	123	128	133	138	143	148
	1	1	2	2	3	3	4	4	17	110	115	121	126	131	136	142	147	152	157
	1	1	2	2	3	3	4	4	18	117	122	128	133	139	144	150	156	161	167
	1	1	2	2	3	4	4	5	19	123	129	135	141	147	152	158	164	170	176
	1	1	2	2	3	4	4	5	20	130	136	142	148	154	160	167	173	179	185
	1	1	2	3	3	4	5	5	21	136	143	149	156	162	169	175	181	188	194
	1	1	2	3	3	4	5	5	22	143	149	156	163	170	177	183	190	197	204
	1	1	2	3	4	4	5	6	23	149	156	163	170	177	185	192	199	206	213
	1	1	2	3	4	4	5	6	24	156	163	170	178	185	193	200	207	215	222
	1	2	2	3	4	5	5	6	25	162	170	177	185	193	201	208	216	224	231
	1	2	2	3	4	5	6	6	26	169	177	185	193	201	209	217	225	233	241
	1	2	3	3	4	5	6	7	27	175	183	192	200	208	217	225	233	242	250
	1	2	3	3	4	5	6	7	28	181	190	199	207	216	225	233	242	251	259
	1	2	3	4	4	5	6	7	29	188	197	206	215	224	233	242	251	260	269
	1	2	3	4	5	6	6	7	30	194	204	213	222	231	241	250	259	269	278
	1	2	3	4	5	6	7	8	31	201	210	220	230	239	249	258	268	277	287
	1	2	3	4	5	6	7	8	32	207	217	227	237	247	257	267	277	286	296
	1	2	3	4	5	6	7	8	33	214	224	234	244	255	265	275	285	295	306
	1	2	3	4	5	6	7	8	34	220	231	241	252	262	273	283	294	304	315
	1	2	3	4	5	6	8	9	35	227	238	248	259	270	281	292	302	313	324
	1	2	3	4	6	7	8	9	36	233	244	256	267	278	289	300	311	322	333
	1	2	3	5	6	7	8	9	37	240	251	263	274	285	297	308	320	331	343
	1	2	4	5	6	7	8	9	38	246	258	270	281	293	305	317	328	340	352
	1	2	4	5	6	7	8	10	39	253	265	277	289	301	313	325	337	349	361
	1	2	4	5	6	7	9	10	40	259	272	284	296	309	321	333	346	358	370
	1	3	4	5	6	8	9	10	41	266	278	291	304	316	329	342	354	367	380
	1	3	4	5	6	8	9	10	42	272	285	298	311	324	337	350	363	376	389
	1	3	4	5	7	8	9	11	43	279	292	305	319	332	345	358	372	385	398
	1	3	4	5	7	8	10	11	44	285	299	312	326	340	353	367	380	394	407
	1	3	4	6	7	8	10	11	45	292	306	319	333	347	361	375	389	403	417
	1	3	4	6	7	9	10	11	46	298	312	327	341	355	369	383	398	412	426
	1	3	4	6	7	9	10	12	47	305	319	334	348	363	377	392	406	421	435
	1	3	4	6	7	9	10	12	48	311	326	341	356	370	385	400	415	430	444
	2	3	5	6	8	9	11	12	49	318	333	348	363	378	393	408	423	439	454
	2	3	5	6	8	9	11	12	50	324	340	355	370	386	401	417	432	448	463
.1	.2	.3	.4	.5	.6	.7	.8	.9		21	22	23	24	25	26	27	28	29	30

Corrections for tenths of width′—width.

0.1	1	1	1	1	1	1	1	1	1	1
0.2	1	1	1	1	2	2	2	2	2	2
0.3	2	2	2	2	2	2	3	3	3	3
0.4	3	3	3	3	3	3	3	3	4	4
0.5	3	3	4	4	4	4	4	4	4	5
0.6	4	4	4	4	5	5	5	5	5	6
0.7	5	5	5	5	5	6	6	6	6	6
0.8	5	5	6	6	6	6	7	7	7	7
0.9	6	6	6	7	7	7	8	8	8	8

Corrections for tenths of height—height′.

.1	.2	.3	.4	.5	.6	.7	.8	.9	w′—w.	31	32	33	34	35	36	37	38	39	40
									1	10	10	10	10	11	11	11	12	12	12
								1	2	19	20	20	21	22	22	23	23	24	25
						1	1	1	3	29	30	31	31	32	33	34	35	36	37
					1	1	1	1	4	38	40	41	42	43	44	46	47	48	49
				1	1	1	1	1	5	48	49	51	52	54	56	57	59	60	62
			1	1	1	1	1	2	6	57	59	61	63	65	67	69	70	72	74
			1	1	1	2	2	2	7	67	69	71	73	76	78	80	82	84	86
			1	1	1	2	2	2	8	77	79	81	84	86	89	91	94	96	99
		1	1	1	1	2	2	2	9	86	89	92	94	97	100	103	106	108	111
		1	1	1	2	2	2	2	10	96	99	102	105	108	111	114	117	120	123
		1	1	1	2	2	2	3	11	105	109	112	115	119	122	126	129	132	136
		1	1	1	2	2	3	3	12	115	119	122	126	130	133	137	141	144	148
		1	1	2	2	2	3	3	13	124	128	132	136	140	144	148	152	156	160
		1	1	2	2	3	3	3	14	134	138	143	147	151	156	160	164	169	173
		1	1	2	2	3	3	4	15	144	148	153	157	162	167	171	176	181	185
		1	1	2	2	3	3	4	16	153	158	163	168	173	178	183	188	193	198
	1	1	2	2	3	3	4	4	17	163	168	173	178	184	189	194	199	205	210
	1	1	2	2	3	3	4	4	18	172	178	183	189	194	200	206	211	217	222
	1	1	2	2	3	4	4	5	19	182	188	194	199	205	211	217	223	229	235
	1	1	2	2	3	4	4	5	20	191	198	204	210	216	222	228	235	241	247
	1	1	2	3	3	4	5	5	21	201	207	214	220	227	233	240	246	253	259
	1	1	2	3	3	4	5	5	22	210	217	224	231	238	244	251	258	265	272
	1	1	2	3	4	4	5	6	23	220	227	234	241	248	256	263	270	277	284
	1	1	2	3	4	4	5	6	24	230	237	244	252	259	267	274	281	289	296
	1	2	2	3	4	5	5	6	25	239	247	255	262	270	278	285	293	301	309
	1	2	2	3	4	5	6	6	26	249	257	265	273	281	289	297	305	313	321
	1	2	3	3	4	5	6	7	27	258	267	275	283	292	300	308	317	325	333
	1	2	3	3	4	5	6	7	28	268	277	285	294	302	311	320	328	337	346
	1	2	3	4	4	5	6	7	29	277	286	295	304	313	322	331	340	349	358
	1	2	3	4	5	6	6	7	30	287	296	306	315	324	333	343	352	361	370
	1	2	3	4	5	6	7	8	31	297	306	316	325	335	344	354	364	373	383
	1	2	3	4	5	6	7	8	32	306	316	326	336	346	356	365	375	385	395
	1	2	3	4	5	6	7	8	33	316	326	336	346	356	367	377	387	397	407
	1	2	3	4	5	6	7	8	34	325	336	346	357	367	378	388	399	409	420
	1	2	3	4	5	6	8	9	35	335	346	356	367	378	389	400	410	421	432
	1	2	3	4	6	7	8	9	36	344	356	367	378	389	400	411	422	433	444
	1	2	3	5	6	7	8	9	37	354	365	377	388	400	411	423	434	445	457
	1	2	4	5	6	7	8	9	38	364	375	387	399	410	422	434	446	457	469
	1	2	4	5	6	7	8	10	39	373	385	397	409	421	433	445	457	469	481
	1	2	4	5	6	7	9	10	40	383	395	407	420	432	444	457	469	481	494
	1	3	4	5	6	8	9	10	41	392	405	418	430	443	456	468	481	494	506
	1	3	4	5	6	8	9	10	42	402	415	428	441	454	467	480	493	506	519
	1	3	4	5	7	8	9	11	43	411	425	438	451	465	478	491	504	518	531
	1	3	4	5	7	8	10	11	44	421	435	448	462	475	489	502	516	530	543
	1	3	4	6	7	8	10	11	45	431	444	458	472	486	500	514	528	542	556
	1	3	4	6	7	9	10	11	46	440	454	469	483	497	511	525	540	554	568
	1	3	4	6	7	9	10	12	47	450	464	479	493	508	522	537	551	566	580
	1	3	4	6	7	9	10	12	48	459	474	489	504	519	533	548	563	578	593
	2	3	5	6	8	9	11	12	49	469	484	499	514	529	544	560	575	590	605
	2	3	5	6	8	9	11	12	50	478	494	509	525	540	556	571	586	602	617
.1	.2	.3	.4	.5	.6	.7	.8	.9		31	32	33	34	35	36	37	38	39	40

Corrections for tenths of width′—width.										
0.1	1	1	1	1	1	1	1	1	1	1
0.2	2	2	2	2	2	2	2	2	2	2
0.3	3	3	3	3	3	3	3	4	4	4
0.4	4	4	4	4	4	4	5	5	5	5
0.5	5	5	5	5	5	6	6	6	6	6
0.6	6	6	6	6	6	7	7	7	7	7
0.7	7	7	7	7	8	8	8	8	8	9
0.8	8	8	8	8	9	9	9	9	10	10
0.9	9	9	9	9	10	10	10	11	11	11

Corrections for tenths of height—height′.

.1	.2	.3	.4	.5	.6	.7	.8	.9	w′—w.	41	42	43	44	45	46	47	48	49	50
									1	13	13	13	14	14	14	15	15	15	15
								1	2	25	26	27	27	28	28	29	30	30	31
					1	1	1	1	3	38	39	40	41	42	43	44	44	45	46
				1	1	1	1	1	4	51	52	53	54	56	57	58	59	60	62
			1	1	1	1	1	1	5	63	65	66	68	69	71	73	74	76	77
		1	1	1	1	1	1	2	6	76	78	80	81	83	85	87	89	91	93
		1	1	1	1	2	2	2	7	89	91	93	95	97	99	102	104	106	108
		1	1	1	1	2	2	2	8	101	104	106	109	111	114	116	119	121	123
	1	1	1	1	2	2	2	2	9	114	117	119	122	125	128	131	133	136	139
	1	1	1	2	2	2	2	3	10	127	130	133	136	139	142	145	148	151	154
	1	1	1	2	2	2	3	3	11	139	143	146	149	153	156	160	163	166	170
	1	1	1	2	2	3	3	3	12	152	156	159	163	167	170	174	178	181	185
	1	1	2	2	2	3	3	4	13	165	169	173	177	181	185	189	193	197	201
	1	1	2	2	3	3	3	4	14	177	181	186	190	194	199	203	207	212	216
	1	1	2	2	3	3	4	4	15	190	194	199	204	208	213	218	222	227	231
	1	1	2	2	3	3	4	4	16	202	207	212	217	222	227	232	237	242	247
1	1	2	2	3	3	4	4	5	17	215	220	226	231	236	241	247	252	257	262
1	1	2	2	3	3	4	4	5	18	228	233	239	244	250	256	261	267	272	278
1	1	2	2	3	4	4	5	5	19	240	246	252	258	264	270	276	281	287	293
1	1	2	2	3	4	4	5	6	20	253	259	265	272	278	284	290	296	302	309
1	1	2	3	3	4	5	5	6	21	266	272	279	285	292	298	305	311	318	324
1	1	2	3	3	4	5	5	6	22	278	285	292	299	306	312	319	326	333	340
1	1	2	3	4	4	5	6	6	23	291	298	305	312	319	327	334	341	348	355
1	1	2	3	4	4	5	6	7	24	304	311	319	326	333	341	348	356	363	370
1	2	2	3	4	5	5	6	7	25	316	324	332	340	347	355	363	370	378	386
1	2	2	3	4	5	6	6	7	26	329	337	345	353	361	369	377	385	393	401
1	2	3	3	4	5	6	7	8	27	342	350	358	367	375	383	392	400	408	417
1	2	3	3	4	5	6	7	8	28	354	363	372	380	389	398	406	415	423	432
1	2	3	4	4	5	6	7	8	29	367	376	385	394	403	412	421	430	439	448
1	2	3	4	5	6	6	7	8	30	380	389	398	407	417	426	435	444	454	463
1	2	3	4	5	6	7	8	9	31	392	402	411	421	431	440	450	459	469	478
1	2	3	4	5	6	7	8	9	32	405	415	425	435	444	454	464	474	484	494
1	2	3	4	5	6	7	8	9	33	418	428	438	448	458	469	479	489	499	509
1	2	3	4	5	6	7	8	9	34	430	441	451	462	472	483	493	504	514	525
1	2	3	4	5	6	8	9	10	35	443	454	465	475	486	497	508	519	529	540
1	2	3	4	6	7	8	9	10	36	456	467	478	489	500	511	522	533	544	556
1	2	3	5	6	7	8	9	10	37	468	480	491	502	514	525	537	548	560	571
1	2	4	5	6	7	8	9	11	38	481	493	504	516	528	540	551	563	575	586
1	2	4	5	6	7	8	10	11	39	494	506	518	530	542	554	566	578	590	602
1	2	4	5	6	7	9	10	11	40	506	519	531	543	556	568	580	593	605	617
1	3	4	5	6	8	9	10	11	41	519	531	544	557	569	582	595	607	620	633
1	3	4	5	6	8	9	10	12	42	531	544	557	570	583	596	609	622	635	648
1	3	4	5	7	8	9	11	12	43	544	557	571	584	597	610	624	637	650	664
1	3	4	5	7	8	10	11	12	44	557	570	584	598	611	625	638	652	665	679
1	3	4	6	7	8	10	11	12	45	569	583	597	611	625	639	653	667	681	694
1	3	4	6	7	9	10	11	13	46	582	596	610	625	639	653	667	681	696	710
1	3	4	6	7	9	10	12	13	47	595	609	624	638	653	667	682	696	711	725
1	3	4	6	7	9	10	12	13	48	607	622	637	652	667	681	696	711	726	741
2	3	5	6	8	9	11	12	14	49	620	635	650	665	681	696	711	726	741	756
2	3	5	6	8	9	11	12	14	50	633	648	664	679	694	710	725	741	756	772
.1	.2	.3	.4	.5	.6	.7	.8	.9		41	42	43	44	45	46	47	48	49	50

Corrections for tenths of width′—width.

0.1	1	1	1	1	1	1	1	1	2	2
0.2	3	3	3	3	3	3	3	3	3	3
0.3	4	4	4	4	4	4	4	4	5	5
0.4	5	5	5	5	6	6	6	6	6	6
0.5	6	6	7	7	7	7	7	7	8	8
0.6	8	8	8	8	8	9	9	9	9	9
0.7	9	9	9	10	10	10	10	10	11	11
0.8	10	10	11	11	11	11	12	12	12	12
0.9	11	12	12	12	12	13	13	13	14	14

TABLE

OF

CUBIC YARDS PER STATION OF 100 FEET FOR SINGLE AND FOR DOUBLE TRACK ROADBEDS, FOR CENTER HEIGHTS FROM 0 TO 60 FEET AND FOR TRANSVERSE SLOPES FROM 0° TO 28°.

CENTER HEIGHT.	0°= 0.0%	4°= 7.0%	6°= 10.5%	8°= 14.1%	10°= 17.6%	12°= 21.3%	14°= 24.9%	16°= 28.7%	18°= 32.5%	20°= 36.4%	24°= 44.5%	28°= 53.2%
0		9	14	20	25	32	39	48	57	68	95	133
1	63	64	66	69	74	81	89	98	109	122	156	204
2	133	135	138	141	145	151	158	168	181	193	232	290
3	211	213	216	220	225	232	241	251	264	280	323	390
4	296	299	302	307	313	322	332	344	359	378	428	507
5	389	392	396	401	409	419	430	445	463	485	544	636
6	489	493	497	503	512	523	537	554	575	600	668	775
7	596	601	606	612	623	636	652	671	695	724	802	925
8	711	716	722	729	742	756	774	796	823	856	946	1085
9	833	839	845	854	868	884	904	929	960	997	1098	1255
10	963	969	976	986	1002	1020	1043	1070	1105	1146	1260	1436
11	1100	1107	1115	1126	1143	1163	1189	1220	1258	1304	1431	1627
12	1244	1252	1261	1273	1292	1315	1343	1377	1419	1471	1611	1828
13	1396	1404	1415	1427	1449	1474	1505	1543	1589	1646	1800	2040
14	1556	1564	1576	1590	1613	1640	1674	1716	1767	1829	1999	2262
15	1722	1732	1744	1760	1785	1815	1852	1898	1954	2021	2207	2494
16	1896	1907	1920	1938	1965	1997	2038	2087	2148	2222	2424	2737
17	2078	2089	2104	2125	2152	2187	2231	2285	2351	2431	2650	2990
18	2267	2279	2295	2315	2347	2385	2433	2491	2562	2649	2886	3253
19	2463	2476	2493	2513	2550	2591	2642	2705	2782	2875	3131	3527
20	2667	2681	2699	2722	2760	2804	2859	2927	3009	3110	3385	3811
21	2878	2893	2913	2937	2978	3025	3084	3157	3245	3353	3648	4105
22	3096	3113	3134	3160	3203	3254	3317	3395	3490	3605	3920	4410
23	3322	3340	3362	3390	3436	3491	3558	3641	3743	3866	4202	4725
24	3556	3574	3598	3628	3677	3735	3807	3895	4003	4135	4493	5050
25	3796	3815	3841	3873	3926	3987	4064	4158	4272	4412	4793	5386
26	4044	4065	4092	4126	4182	4247	4328	4428	4550	4698	5103	5732
27	4300	4322	4351	4387	4446	4515	4601	4706	4836	4993	5422	6088
28	4563	4586	4617	4655	4717	4790	4881	4993	5130	5296	5750	6455
29	4833	4858	4890	4930	4996	5073	5169	5288	5432	5608	6087	6832
30	5111	5137	5171	5213	5283	5364	5466	5590	5742	5928	6433	7219
31	5396	5424	5459	5504	5577	5663	5770	5901	6061	6257	6789	7617
32	5689	5718	5755	5802	5879	5969	6082	6220	6388	6594	7154	8025
33	5989	6019	6058	6108	6189	6283	6401	6547	6724	6940	7528	8443
34	6296	6328	6369	6421	6506	6605	6729	6882	7068	7294	7912	8871
35	6611	6645	6688	6742	6831	6935	7065	7225	7420	7657	8304	9310
36	6933	6969	7014	7070	7164	7273	7409	7576	7780	8028	8706	9760
37	7263	7300	7347	7406	7504	7618	7760	7935	8148	8408	9117	10219
38	7600	7639	7688	7750	7852	7971	8119	8302	8525	8797	9538	10689
39	7944	7985	8036	8101	8207	8332	8487	8677	8910	9194	9967	11169
40	8296	8338	8392	8459	8570	8700	8862	9061	9303	9599	10406	11660
41	8656	8699	8755	8825	8941	9076	9245	9452	9705	10013	10854	12161
42	9022	9068	9126	9199	9319	9460	9636	9852	10115	10436	11311	12672
43	9396	9444	9504	9580	9705	9852	10035	10259	10533	10867	11778	13193
44	9778	9827	9890	9969	10099	10252	10442	10675	10960	11307	12254	13725
45	10167	10218	10283	10365	10501	10659	10856	11099	11395	11755	12739	14267
46	10563	10616	10684	10769	10910	11074	11279	11531	11838	12212	13233	14820
47	10967	11022	11092	11181	11326	11497	11709	11970	12289	12678	13737	15383
48	11378	11435	11508	11600	11750	11927	12148	12418	12749	13152	14249	15956
49	11796	11855	11931	12026	12182	12366	12594	12874	13217	13634	14771	16539
50	12222	12283	12361	12460	12622	12812	13048	13338	13693	14125	15303	17133
51	12656	12719	12799	12902	13069	13266	13510	13811	14177	14624	15843	17737
52	13096	13162	13245	13351	13524	13727	13980	14291	14670	15132	16393	18352
53	13544	13612	13698	13808	13987	14197	14458	14779	15171	15649	16952	18976
54	14000	14070	14159	14272	14457	14674	14944	15275	15680	16174	17520	19611
55	14463	14535	14627	14744	14935	15158	15437	15780	16198	16708	18097	20257
56	14933	15008	15103	15223	15420	15650	15939	16292	16724	17250	18684	20913
57	15411	15488	15586	15710	15913	16151	16448	16813	17259	17801	19280	21579
58	15896	15976	16077	16205	16414	16660	16966	17342	17801	18360	19885	22255
59	16389	16471	16575	16707	16922	17176	17491	17878	18351	18928	20499	22942
60	16889	16973	17080	17216	17438	17699	18024	18423	18910	19504	21123	23639

CENTER HEIGHT.	0° = 0.0%	4° = 7.0%	6° = 10.5%	8° = 14.1%	10° = 17.6%	12° = 21.3%	14° = 24.9%	16° = 28.7%	18° = 32.5%	20° = 36.4%	24° = 44.5%	28° = 53.2%
0		12	18	24	32	40	50	60	72	86	120	170
1	70	72	75	78	85	94	104	116	130	146	187	249
2	148	150	153	157	163	169	178	190	204	223	271	346
3	233	236	239	244	250	259	269	281	296	315	366	451
4	326	329	333	338	346	356	367	382	400	422	481	574
5	426	430	434	440	449	460	474	491	512	537	605	712
6	533	538	543	549	560	573	589	608	632	661	739	862
7	648	653	659	666	679	693	711	733	760	793	883	1022
8	770	776	782	791	805	821	841	866	897	934	1035	1192
9	900	906	913	923	939	957	980	1007	1042	1083	1197	1373
10	1037	1044	1052	1063	1080	1100	1126	1157	1195	1241	1368	1564
11	1181	1189	1198	1210	1229	1252	1280	1314	1356	1408	1548	1765
12	1333	1341	1352	1365	1386	1411	1442	1480	1526	1583	1737	1977
13	1493	1501	1513	1527	1550	1577	1611	1653	1704	1766	1936	2199
14	1659	1669	1681	1697	1722	1752	1789	1835	1891	1957	2144	2431
15	1833	1844	1857	1874	1901	1934	1975	2024	2085	2159	2361	2674
16	2015	2026	2041	2059	2089	2124	2168	2222	2288	2368	2587	2927
17	2204	2216	2232	2252	2284	2322	2370	2428	2499	2586	2823	3191
18	2400	2413	2430	2452	2487	2528	2579	2642	2719	2812	3068	3464
19	2604	2618	2636	2659	2697	2741	2796	2864	2946	3047	3322	3748
20	2815	2830	2850	2874	2915	2962	3021	3094	3182	3290	3585	4043
21	3033	3050	3071	3097	3140	3191	3254	3332	3427	3542	3857	4347
22	3259	3277	3299	3327	3373	3428	3495	3578	3680	3803	4139	4662
23	3493	3511	3535	3565	3614	3672	3744	3832	3940	4072	4430	4987
24	3733	3752	3778	3810	3863	3924	4001	4095	4209	4349	4731	5323
25	3981	4002	4029	4063	4119	4184	4265	4365	4487	4635	5040	5669
26	4237	4259	4288	4324	4383	4452	4538	4643	4773	4930	5359	6025
27	4500	4523	4554	4592	4654	4727	4818	4930	5067	5233	5687	6392
28	4770	4795	4827	4867	4933	5010	5106	5225	5369	5545	6024	6769
29	5048	5074	5108	5150	5220	5301	5403	5527	5679	5865	6370	7156
30	5333	5361	5396	5441	5514	5600	5707	5838	5998	6194	6726	7554
31	5626	5655	5592	5739	5816	5906	6019	6157	6325	6531	7091	7962
32	5926	5957	5995	6045	6126	6220	6339	6484	6661	6877	7465	8380
33	6233	6266	6306	6358	6443	6542	6666	6819	7005	7231	7849	8808
34	6548	6582	6625	6679	6768	6872	7002	7162	7357	7594	8241	9247
35	6870	6906	6951	7007	7101	7210	7346	7513	7717	7965	8643	9697
36	7200	7237	7284	7343	7441	7555	7697	7872	8085	8345	9054	10156
37	7537	7576	7625	7687	7789	7908	8057	8239	8462	8734	9475	10626
38	7881	7922	7973	8038	8144	8269	8424	8614	8847	9131	9905	11106
39	8233	8275	8329	8396	8507	8637	8799	8998	9240	9536	10344	11597
40	8593	8636	8692	8762	8878	9013	9182	9389	9642	9951	10791	12098
41	8959	9005	9063	9136	9256	9397	9573	9789	10052	10373	11248	12609
42	9333	9381	9441	9517	9642	9789	9972	10196	10470	10804	11715	13130
43	9715	9764	9827	9906	10036	10189	10379	10612	10897	11244	12191	13662
44	10104	10155	10220	10302	10438	10596	10793	11036	11332	11692	12676	14204
45	10500	10553	10621	10706	10847	11011	11216	11468	11775	12149	13170	14757
46	10904	10959	11029	11118	11263	11434	11646	11907	12226	12614	13674	15320
47	11315	11372	11445	11537	11687	11864	12085	12355	12686	13088	14186	15893
48	11733	11792	11868	11963	12119	12303	12531	12811	13154	13571	14708	16476
49	12159	12220	12298	12397	12559	12749	12985	13275	13630	14062	15240	17070
50	12593	12656	12736	12839	13006	13203	13447	13747	14114	14561	15780	17674
51	13033	13099	13182	13288	13461	13664	13917	14228	14607	15069	16330	18289
52	13481	13549	13635	13745	13924	14134	14395	14716	15108	15586	16889	18913
53	13937	14007	14096	14209	14394	14611	14881	15212	15617	16111	17457	19549
54	14400	14472	14564	14681	14872	15095	15374	15717	16135	16645	18034	20194
55	14870	14945	15040	15160	15357	15587	15876	16229	16661	17187	18621	20850
56	15348	15425	15523	15647	15850	16088	16385	16750	17196	17738	19217	21516
57	15833	15913	16014	16142	16351	16597	16903	17279	17738	18297	19822	22192
58	16326	16408	16512	16644	16859	17113	17428	17815	18288	18865	20436	22879
59	16826	16910	17017	17153	17375	17636	17961	18360	18847	19441	21060	23576
60	17333	17420	17530	17670	17899	18168	18502	18913	19415	20026	21693	24283

CENTER HEIGHT.	0° = 0.0%	4° = 7.0%	6° = 10.5%	8° = 14.1%	10° = 17.6%	12° = 21.3%	14° = 24.9%	16° = 28.7%	18° = 32.5%	20° = 36.4%	24° = 44.5%	28° = 53.2%
0		14	22	30	40	50	62	74	89	105	149	210
1	78	80	83	88	97	109	121	135	152	172	221	297
2	163	166	169	173	180	189	200	215	232	254	317	398
3	256	259	263	268	276	285	297	312	330	353	416	514
4	356	359	364	370	379	390	404	421	442	466	536	646
5	463	467	472	479	490	502	518	538	562	590	669	792
6	578	582	588	596	608	623	641	663	690	723	812	951
7	700	705	712	720	734	751	771	796	827	864	965	1122
8	830	836	843	853	868	886	909	937	972	1013	1126	1303
9	967	973	982	992	1010	1030	1055	1086	1125	1171	1297	1494
10	1111	1118	1128	1139	1159	1181	1209	1244	1286	1337	1477	1695
11	1263	1271	1281	1294	1315	1340	1371	1409	1456	1512	1667	1907
12	1422	1431	1442	1456	1480	1507	1541	1583	1634	1696	1865	2129
13	1589	1598	1611	1626	1652	1682	1719	1764	1821	1888	2073	2361
14	1763	1773	1787	1804	1831	1864	1904	1954	2015	2089	2290	2604
15	1944	1956	1970	1989	2019	2054	2098	2152	2218	2298	2517	2857
16	2133	2146	2161	2181	2214	2252	2299	2358	2429	2516	2752	3120
17	2330	2343	2360	2381	2416	2457	2509	2572	2649	2742	2997	3394
18	2533	2548	2566	2589	2626	2671	2726	2793	2876	2977	3251	3678
19	2744	2760	2779	2804	2845	2892	2951	3023	3112	3220	3515	3972
20	2963	2979	3000	3027	3070	3121	3184	3262	3357	3472	3787	4277
21	3189	3206	3229	3257	3303	3357	3425	3508	3610	3732	4069	4592
22	3422	3441	3465	3495	3544	3602	3674	3762	3870	4001	4360	4917
23	3663	3683	3708	3740	3792	3854	3930	4024	4139	4279	4660	5253
24	3911	3932	3959	3993	4048	4114	4195	4294	4417	4565	4970	5599
25	4167	4189	4217	4253	4312	4381	4467	4573	4703	4859	5288	5955
26	4430	4453	4483	4521	4584	4657	4748	4860	4997	5163	5616	6322
27	4700	4725	4757	4797	4863	4940	5036	5154	5299	5474	5954	6699
28	4978	5004	5038	5080	5149	5231	5332	5457	5609	5794	6300	7086
29	5263	5291	5326	5371	5444	5530	5636	5768	5928	6123	6656	7483
30	5556	5585	5622	5669	5746	5836	5948	6086	6255	6460	7021	7891
31	5856	5886	5925	5975	6055	6150	6268	6413	6591	6806	7395	8309
32	6163	6195	6236	6288	6373	6472	6596	6748	6935	7161	7778	8738
33	6478	6511	6554	6609	6698	6802	6932	7091	7287	7524	8171	9177
34	6800	6835	6880	6937	7030	7139	7275	7442	7647	7895	8573	9626
35	7130	7166	7213	7273	7370	7485	7627	7802	8015	8275	8984	10086
36	7467	7505	7554	7616	7718	7838	7986	8169	8392	8663	9403	10556
37	7811	7851	7902	7967	8074	8198	8353	8544	8777	9060	9834	11036
38	8163	8205	8258	8326	8437	8567	8729	8927	9170	9466	10273	11526
39	8522	8566	8622	8692	8808	8943	9112	9319	9572	9880	10721	12027
40	8889	8934	8993	9066	9186	9327	9503	9718	9982	10303	11178	12538
41	9263	9310	9371	9447	9572	9718	9902	10126	10400	10734	11645	13060
42	9644	9694	9756	9836	9966	10118	10308	10542	10827	11174	12120	13592
43	10033	10085	10149	10232	10367	10526	10723	10965	11262	11622	126 6	14134
44	10430	10483	10550	10636	10776	10941	11146	11397	11705	12079	13100	14686
45	10833	10888	10958	11047	11193	11363	11576	11837	12156	12544	13603	15249
46	11244	11301	11374	11466	11617	11794	12014	12285	12616	13018	14116	15822
47	11663	11722	11797	11893	12049	12232	12461	12741	13084	13501	14638	16406
48	12089	12150	12228	12327	12489	12678	12915	13205	13560	13991	15169	17000
49	12522	12586	12666	12769	12936	13132	13377	13677	14044	14491	15710	17604
50	12963	13029	13112	13218	13391	13594	13847	14157	14537	14999	16259	18218
51	13411	13479	13565	13674	13853	14063	14325	14646	15038	15516	16818	18843
52	13867	13937	14026	14139	14323	14540	14810	15142	15547	16041	17387	19478
53	14330	14402	14494	14611	14802	15024	15304	15647	16065	16574	17964	20124
54	14800	14875	14969	15090	15287	15517	15806	16159	16591	17117	18551	20779
55	15278	15355	15452	15577	15780	16018	16315	16680	17126	17667	19147	21445
56	15763	15842	15943	16071	16281	16526	16832	17208	17668	18227	19752	22122
57	16256	16337	16441	16573	16789	17042	17358	17745	18218	18794	20366	22809
58	16756	16840	16947	17083	17305	17566	17891	18290	18777	19371	20990	23506
59	17263	17350	17460	17600	17829	18097	18432	18843	19345	19956	21623	24213
60	17778	17867	17981	18125	18360	18637	18981	19404	19922	20549	22265	24931

CENTER HEIGHT	0°= 0.0%	4°= 7.0%	6°= 10.5%	8°= 14.1%	10°= 17.6%	12°= 21.3%	14°= 24.9%	16°= 28.7%	18°= 32.5%	20°= 36.4%	24°= 44.5%	28°= 53.2%
0		30	46	65	84	105	129	156	188	223	312	434
1	111	115	125	141	161	183	209	241	275	322	417	564
2	230	235	241	247	263	284	312	343	380	424	536	701
3	356	361	368	378	392	409	433	464	502	548	670	853
4	489	495	503	514	530	549	573	603	641	688	819	1020
5	630	637	645	658	675	696	723	756	796	846	984	1201
6	778	785	795	809	828	851	881	917	962	1015	1163	1398
7	933	942	952	968	988	1014	1047	1087	1135	1195	1357	1609
8	1096	1106	1117	1134	1156	1185	1221	1264	1318	1383	1560	1835
9	1267	1277	1290	1308	1332	1363	1402	1450	1508	1579	1772	2073
10	1444	1455	1469	1489	1516	1550	1592	1644	1707	1784	1994	2321
11	1630	1642	1657	1678	1707	1744	1789	1845	1914	1997	2225	2579
12	1822	1835	1851	1875	1906	1945	1995	2055	2129	2219	2465	2847
13	2022	2036	2054	2079	2112	2155	2208	2273	2353	2450	2715	3126
14	2230	2244	2263	2290	2326	2372	2429	2499	2585	2689	2973	3415
15	2444	2460	2480	2509	2548	2597	2658	2733	2825	2937	3241	3715
16	2666	2684	2705	2736	2777	2830	2895	2975	3073	3193	3518	4025
17	2896	2914	2938	2970	3014	3070	3140	3226	3330	3458	3805	4345
18	3133	3153	3177	3212	3259	3318	3393	3484	3595	3731	4101	4675
19	3378	3398	3424	3462	3511	3574	3653	3750	3868	4013	4405	5016
20	3630	3651	3679	3718	3771	3838	3922	4025	4150	4303	4719	5367
21	3889	3912	3941	3983	4039	4110	4198	4307	4440	4602	5043	5729
22	4156	4180	4211	4255	4314	4389	4483	4598	4738	4909	5375	6100
23	4430	4455	4488	4534	4597	4676	4775	4896	5045	5225	5717	6482
24	4711	4738	4773	4822	4887	4971	5075	5203	5359	5549	6068	6875
25	5000	5028	5065	5116	5186	5273	5383	55.8	5682	5882	6429	7278
26	5296	5326	5364	5419	5492	5584	5699	5841	6014	6224	6798	7691
27	5600	5631	5671	5728	5805	5902	6023	6171	6353	6574	7177	8114
28	5911	5944	5986	6046	6126	6228	6354	6510	6701	6933	7565	8548
29	6230	6264	6308	6371	6455	6561	6694	6857	7057	7300	7962	8992
30	6556	6592	6638	6703	6791	6903	7042	7213	7421	7676	8369	9446
31	6889	6927	6974	7043	7135	7252	7397	7576	7794	8060	8785	9911
32	7230	7269	7319	7391	7487	7609	7760	7947	8175	8453	9210	10386
33	7578	7619	7671	7746	7846	7973	8132	8326	8564	8854	9644	10871
34	7933	7976	8031	8109	8213	8346	8511	8714	8962	9264	10087	11367
35	8296	8341	8398	8479	8588	8726	8898	9109	9368	9682	10540	11873
36	8666	8713	8772	8857	8970	9114	9293	9513	9782	10109	11002	12389
37	9044	9093	9154	9242	9360	9509	9695	9924	10204	10545	11473	12916
38	9430	9480	9544	9635	9757	9913	10106	10344	10635	10989	11953	13453
39	9822	9874	9941	10036	10163	10324	10525	10772	11074	11441	12443	14000
40	10222	10276	10345	10444	10576	10743	10951	11208	11521	11902	12942	14558
41	10630	10686	10757	10859	10996	11170	11386	11652	11976	12372	13450	15126
42	11044	11102	11176	11282	11424	11604	11828	12104	12440	12850	13967	15704
43	11467	11527	11603	11713	11860	12046	12278	12564	12912	13337	14494	16293
44	11896	11959	12038	12152	12303	12496	12736	13032	13393	13832	15030	16892
45	12333	12398	12480	12597	12754	12954	13202	13508	13881	14336	15575	17501
46	12778	12844	12929	13051	13213	13419	13676	13992	14378	14848	16129	18121
47	13230	13298	13386	13512	13679	13893	14158	14485	14883	15369	16693	18751
48	13689	13760	13850	13980	14153	14374	14648	14985	15397	1589	17266	19391
49	14156	14229	14322	14456	14635	14862	15145	15493	15919	16436	17848	20042
50	14630	14705	14801	14940	15124	15359	15651	16010	16449	16983	18439	20703
51	15111	15189	15288	15431	15621	15863	16164	16535	16987	17538	19040	21374
52	15600	15680	15783	15930	16126	16375	16685	17067	17534	18101	19649	22055
53	16096	16179	16285	16436	16638	16895	17215	17608	18089	18673	20268	22747
54	16600	16685	16794	16950	17158	17422	17752	18157	18652	19254	20897	23449
55	17111	17199	17311	17471	17686	17958	18297	18714	19223	19843	21534	24162
56	17630	17720	17835	18000	18221	18501	18849	19279	19803	20441	22181	24885
57	18156	18249	18367	18537	18764	19052	19410	19852	20391	21047	22837	25618
58	18689	18785	18906	19081	19314	19610	19979	20433	20987	21662	23502	26362
59	19230	19328	19453	19633	19872	20176	20556	21022	21592	22285	24176	27115
60	19778	19879	20007	20192	20438	20751	21140	21619	22205	22917	24860	27880

CENTER HEIGHT	0°= 0.0%	4°= 7.0%	6°= 10.5%	8°= 14.1%	10°= 17.6%	12°= 21.3%	14°= 24.9%	16°= 28.7%	18°= 32.5%	20°= 36.4%	24°= 44.5%	28°= 53.2%
0		34	52	73	95	120	148	179	214	254	357	505
1	119	124	136	153	178	204	234	268	308	353	468	635
2	244	250	257	268	286	310	341	376	418	467	594	780
3	378	384	392	403	419	440	466	502	545	598	735	940
4	519	525	534	547	564	585	612	646	689	744	891	1114
5	667	673	684	698	717	740	770	806	853	906	1062	1304
6	822	829	841	857	877	903	936	976	1024	1084	1248	1508
7	985	994	1006	1023	1045	1074	1109	1153	1207	1272	1449	1727
8	1156	1166	1179	1197	1221	1252	1291	1339	1397	1468	1661	1961
9	1333	1344	1358	1378	1405	1439	1481	1533	1596	1673	1883	2210
10	1519	1530	1546	1567	1596	1633	1678	1734	1803	1886	2114	2468
11	1711	1724	1740	1764	1795	1834	1883	1944	2018	2108	2354	2736
12	1911	1925	1943	1968	2001	2044	2097	2161	2242	2339	2604	3015
13	2119	2133	2152	2179	2215	2261	2318	2387	2474	2578	2862	3304
14	2333	2349	2369	2398	2437	2486	2547	2622	2714	2826	3130	3604
15	2556	2572	2594	2625	2666	2719	2784	2864	2962	3082	3407	3913
16	2785	2803	2826	2859	2903	2959	3029	3114	3219	3346	3694	4234
17	3022	3041	3066	3101	3148	3207	3281	3373	3484	3620	3989	4564
18	3267	3287	3313	3350	3400	3463	3542	3639	3757	3901	4294	4905
19	3519	3540	3568	3607	3660	3727	3811	3913	4039	4192	4608	5256
20	3778	3801	3830	3872	3928	3998	4087	4196	4329	4491	4932	5617
21	4044	4069	4100	4144	4203	4276	4371	4487	4627	4798	5264	5989
22	4319	4344	4377	4423	4486	4563	4664	4785	4933	5114	5606	6371
23	4600	4627	4662	4711	4776	4859	4964	5092	5248	5438	5957	6764
24	4889	4917	4954	5005	5075	5162	5272	5407	5571	5771	6318	7166
25	5185	5215	5253	5308	5381	5473	5588	5729	5902	6113	6687	7579
26	5489	5520	5560	5617	5694	5791	5912	6060	6242	6463	7066	8003
27	5800	5833	5875	5935	6015	6117	6243	6399	6590	6822	7454	8437
28	6119	6153	6197	6260	6344	6450	6583	6746	6946	7189	7851	8881
29	6444	6480	6527	6592	6680	6792	6930	7102	7310	7564	8258	9335
30	6778	6815	6863	6932	7024	7141	7286	7465	7683	7949	8673	9800
31	7119	7158	7208	7280	7376	7498	7649	7836	8064	8342	9098	10275
32	7467	7508	7560	7635	7735	7862	8020	8215	8453	8743	9533	10760
33	7822	7865	7920	7998	8102	8235	8400	8603	8851	9153	9976	11256
34	8185	8230	8287	8368	8477	8615	8787	8998	9257	9571	10429	11762
35	8556	8602	8661	8746	8859	9003	9181	9402	9671	9998	10891	12278
36	8933	8982	9043	9131	9249	9398	9584	9813	10093	10433	11362	12805
37	9319	9369	9434	9524	9646	9802	9995	10233	10524	10877	11842	13342
38	9711	9763	9831	9925	10052	10213	10414	10661	10963	11330	12332	13889
39	10111	10165	10234	10333	10465	10632	10840	11097	11410	11791	12831	14447
40	10519	10575	10646	10748	10885	11058	11275	11541	11865	12261	13339	15015
41	10933	10991	11065	11171	11313	11493	11717	11993	12329	12739	13856	15593
42	11356	11416	11492	11602	11749	11935	12167	12453	12801	13226	14383	16182
43	11785	11847	11927	12041	12192	12385	12625	12921	13282	13721	14919	16781
44	12222	12287	12369	12486	12643	12843	13091	13397	13770	14225	15464	17390
45	12667	12733	12818	12940	13102	13308	13565	13881	14267	14737	16018	18010
46	13119	13187	13275	13401	13568	13781	14047	14374	14772	15258	16582	18640
47	13578	13649	13739	13869	14042	14262	14537	14874	15286	15787	17155	19280
48	14044	14118	14211	14345	14524	14751	15034	15382	15808	16325	17737	19930
49	14519	14594	14691	14829	15013	15248	15540	15899	16338	16872	18328	20591
50	15000	15078	15177	15320	15510	15752	16053	16424	16876	17427	18928	21263
51	15489	15569	15672	15819	16015	16264	16574	16956	17423	17990	19538	21944
52	15985	16068	16174	16325	16527	16784	17103	17497	17977	18562	20157	22636
53	16489	16574	16683	16839	17047	17311	17641	18046	18541	19143	20785	23338
54	17000	17088	17200	17360	17575	17847	18186	18603	19112	19732	21423	24051
55	17519	17609	17724	17889	18110	18390	18738	19168	19692	20330	22070	24774
56	18044	18137	18256	18426	18652	18940	19299	19741	20280	20936	22726	25507
57	18578	18673	18795	18970	19203	19499	19868	20322	20876	21551	23391	26250
58	19119	19217	19342	19522	19761	20065	20444	20911	21481	22174	24065	27004
59	19667	19768	19896	20081	20327	20639	21029	21508	22094	22806	24749	27768
60	20222	20326	20458	20647	20900	21221	21621	22114	22715	23446	25442	28543

ROADBED 33 FEET. SIDE SLOPE 1 TO 1.

CENTER HEIGHT.	0°= 0.0%	4°= 7.0%	6°= 10.5%	8°= 14.1%	10°= 17.6%	12°= 21.3%	14°= 24.9%	16°= 28.7%	18°= 32.5%	20°= 36.4%	24°= 44.5%	28°= 53.2%
0		38	59	81	108	136	167	203	243	288	405	572
1	126	132	147	169	195	225	259	297	341	392	522	710
2	260	265	273	286	307	335	370	410	457	512	655	863
3	401	407	416	428	445	468	501	541	590	648	802	1031
4	549	555	566	579	598	622	651	690	738	801	965	1213
5	704	712	723	738	759	785	817	857	906	968	1143	1411
6	867	876	888	904	927	955	991	1035	1088	1153	1335	1623
7	1038	1047	1060	1078	1103	1134	1173	1220	1278	1349	1544	1850
8	1215	1226	1240	1260	1286	1320	1362	1414	1477	1554	1764	2092
9	1401	1412	1427	1448	1477	1514	1560	1616	1685	1768	1995	2349
10	1593	1605	1622	1645	1676	1716	1765	1826	1900	1990	2236	2618
11	1793	1806	1824	1849	1883	1925	1978	2044	2123	2220	2485	2897
12	2001	2015	2034	2061	2097	2142	2199	2270	2355	2459	2744	3186
13	2215	2231	2251	2280	2318	2367	2428	2504	2595	2707	3012	3485
14	2438	2454	2476	2506	2548	2600	2665	2746	2844	2963	3289	3795
15	2767	2685	2708	2741	2785	2341	2910	2996	3100	3228	3575	4115
16	2904	2923	2947	2982	3029	3089	3163	3254	3366	3501	3871	4446
17	3149	3169	3195	3232	3282	3345	3424	3521	3639	3783	4176	4786
18	3401	3422	3449	3489	3542	3609	3692	3795	3920	4073	4490	5137
19	3660	3682	3712	3753	3809	3880	3969	4077	4210	4372	4813	5499
20	3926	3950	3981	4025	4084	4158	4253	4368	4508	4679	5146	5871
21	4201	4226	4258	4305	4367	4446	4545	4667	4815	4995	5488	6253
22	4482	4508	4543	4592	4658	4741	4845	4973	5130	5320	5839	6645
23	4771	4799	4835	4887	4956	5044	5153	5288	5453	5653	6199	7048
24	5067	5097	5135	5189	5262	5354	5469	5611	5784	5994	6569	7461
25	5371	5402	5442	5499	5575	5672	5793	5942	6123	6344	6947	7884
26	5682	5714	5756	5816	5896	5998	6125	6281	6471	6703	7335	8318
27	6001	5034	6078	6141	6225	6332	6464	6628	6827	7070	7733	8762
28	6326	6362	6408	6474	6561	6673	6812	6983	7192	7446	8139	9217
29	6660	6697	6745	6814	6905	7022	7167	7346	7564	7830	8555	9681
30	7000	7039	7089	7161	7257	7379	7531	7717	7945	8223	8980	10156
31	7349	7389	7441	7516	7616	7744	7902	8097	8335	8624	9414	10642
32	7704	7747	7801	7879	7983	8116	8281	8484	8732	9034	9858	11137
33	8067	8111	8168	8249	8358	8496	8668	8880	9138	9453	10310	11643
34	8438	4483	8543	8627	8740	8884	9063	9283	9552	9879	10772	12160
35	8815	8863	8924	9013	9130	9280	9466	9695	9975	10315	11243	12686
36	9201	9250	9314	9406	9528	9683	9877	10115	10405	10759	11724	13223
37	9593	9645	9711	9806	9933	10094	10296	10542	10844	11211	12213	13771
38	9993	10047	10115	10214	10346	10513	10722	10978	11291	11673	12712	14328
39	10401	10456	10527	10630	10766	10940	11156	11422	11747	12142	13220	14896
40	10815	10873	10947	11053	11194	11374	11598	11874	12211	12620	13738	15475
41	11238	11297	11374	11484	11630	11817	12048	12334	12683	13107	14264	16063
42	11667	11729	11808	11922	12074	22266	12507	12802	13163	13602	14800	16662
43	12104	12168	12250	12368	12525	12724	12973	13278	13652	14106	15345	17271
44	12549	12615	12699	12821	12983	13190	13446	13763	14149	14618	15900	17891
45	13001	13069	13156	13282	13450	13663	13928	14255	14654	15139	16463	18521
46	13460	13530	13621	13751	13924	14144	14418	14755	15167	15669	17036	19161
47	13926	13999	14093	14227	14405	14633	14916	15264	15689	16207	17618	19812
48	14401	14476	14572	14710	14895	15129	15421	15780	16219	16753	18209	20473
49	14882	14960	15059	15201	15392	15633	15934	16305	16757	17308	18810	21144
50	15371	15451	15554	15700	15896	16145	16456	16838	17304	17872	19420	21826
51	15867	15950	16055	16207	16409	16665	16985	17378	17859	18444	20039	22518
52	16371	16456	16564	16720	16928	17193	17522	17927	18422	19024	20667	23220
53	16882	16969	17081	17242	17456	17728	18067	18484	18994	19613	21304	23932
54	17401	17490	17606	17771	17991	18271	18620	19049	19573	20211	21951	24655
55	17926	18019	18137	18307	18534	18822	19181	19622	20161	20817	22607	25388
56	18460	18555	18677	18851	19084	19381	19749	20203	20758	21432	23272	26132
57	19001	19098	19223	19403	19642	19947	20326	20793	21362	22056	23947	26886
58	19549	19649	19778	19962	20208	20521	20910	21390	21975	22687	24630	27650
59	20104	20207	20339	20529	20782	21103	21503	21995	22596	23328	25323	28424
60	20666	20773	20909	21103	21363	21692	22103	22608	23226	23977	26025	29209

ROADBED 14 FEET. SIDE SLOPE 1¼ TO 1.

CENTER HEIGHT	0°= 0.0%	4°= 7.0%	6°= 10.5%	8°= 14.1%	10°= 17.6%	12°= 21.3%	14°= 24.9%	16°= 28.7%	18°= 32.5%	20°= 36.4%	24°= 44.5%	28°= 53.2%
0		7	11	16	22	28	36	45	57	73	122	238
1	57	59	62	66	73	79	89	102	118	142	212	384
2	126	129	132	137	145	154	166	181	202	231	328	563
3	206	209	214	221	230	242	259	280	307	344	468	777
4	296	301	307	316	328	344	364	391	426	474	632	1026
5	398	404	411	422	437	457	483	516	560	619	816	1306
6	511	518	527	540	559	583	614	655	708	780	1020	1616
7	635	644	655	670	692	721	758	807	871	956	1244	1957
8	770	780	793	812	837	871	915	973	1048	1149	1488	2329
9	917	928	943	965	995	1034	1085	1152	1240	1357	1752	2731
10	1074	1087	1105	1130	1164	1209	1268	1345	1446	1582	2036	3163
11	1243	1258	1277	1306	1345	1397	1464	1552	1667	1822	2340	3626
12	1422	1439	1461	1494	1538	1597	1673	1772	1903	2078	2665	4120
13	1613	1632	1657	1693	1743	1809	1895	2007	2153	2349	3009	4644
14	1815	1836	1864	1905	1960	2034	2129	2254	2418	2637	3373	5199
15	2028	2052	2083	2128	2189	2271	2377	2516	2697	2940	3758	5784
16	2252	2278	2312	2362	2430	2520	2638	2791	2991	3259	4162	6400
17	2487	2516	2553	2608	2683	2782	2911	3079	3300	3595	4587	7046
18	2733	2765	2806	2866	2948	3056	3197	3381	3623	3945	5031	7723
19	2991	3025	3070	3135	3224	3343	3497	3697	3960	4312	5496	8430
20	3259	3297	3345	3416	3513	3642	3809	4027	4312	4695	5981	9168
21	3539	3580	3632	3709	3814	3953	4134	4370	4679	5093	6486	9936
22	3830	3874	3930	4013	4126	4277	4472	4726	5060	5507	7010	10736
23	4132	4179	4240	4329	4451	4614	4823	5097	5456	5937	7555	11565
24	4444	4495	4561	4657	4788	4962	5187	5481	5867	6383	8120	12425
25	4769	4823	4893	4996	5136	5322	5564	5878	6292	6845	8705	13316
26	5104	5162	5237	5347	5496	5695	5853	6290	6731	7322	9310	14237
27	5450	5512	5592	5709	5869	6080	6356	6715	7186	7816	9935	15189
28	5807	5873	5959	6083	6253	6478	6771	7153	7654	8325	10580	16171
29	6176	6246	6337	6469	6649	6888	7200	7605	8138	8850	11246	17184
30	6556	6630	6726	6866	7058	7311	7641	8071	8636	9391	11931	18227
31	6946	7025	7126	7275	7478	7746	8096	8551	9148	9947	12636	19301
32	7348	7431	7538	7695	7910	8193	8563	9043	9675	10519	13361	20404
33	7761	7849	7961	8128	8354	8653	9043	9550	10217	11108	14107	21540
34	8185	8278	8396	8572	8810	9125	9536	10071	10773	11712	14873	22705
35	8620	8718	8843	9027	9278	9610	10042	10605	11344	12332	15658	23901
36	9067	9169	9301	9494	9758	10106	10561	11152	11929	12968	16464	25127
37	9524	9631	9770	9973	10250	10616	11093	11714	12529	13620	17290	26385
38	9993	10105	10250	10463	10753	11137	11637	12288	13143	14287	18135	27672
39	10472	10590	10742	10965	11269	11671	12195	12877	13772	14970	19001	28990
40	10963	11086	11246	11478	11797	12217	12765	13479	14416	15670	19887	30339
41	11465	11594	11760	12004	12336	12776	13349	14095	15074	16385	20793	31717
42	11978	12112	12286	12541	12888	13347	13945	14725	15747	17115	21719	33127
43	12502	12642	12824	13089	13451	13930	14555	15367	16434	17862	22665	34568
44	13037	13183	13372	13649	14027	14526	15177	16024	17136	18625	23631	36038
45	13583	13736	13932	14221	14614	15134	15812	16694	17853	19403	24617	37540
46	14141	14299	14504	14804	15214	15755	16460	17378	18584	20197	25623	39073
47	14709	14874	15087	15399	15825	16388	17121	18076	19330	21007	26649	40634
48	15289	15460	15682	16006	16448	17033	17795	18788	20090	21833	27696	42227
49	15880	16058	16288	16624	17083	17690	18482	19512	20864	22674	28762	43850
50	16481	16666	16905	17254	17730	18360	19181	20250	21654	23532	29848	45504
51	17094	17286	17533	17896	18389	19042	19894	21002	22458	24405	30955	47189
52	17719	17917	18173	18549	19060	19737	20619	21768	23276	25294	32081	48904
53	18354	18559	18825	19213	19743	20444	21358	22547	24109	26199	33228	50649
54	19000	19213	19488	19889	20438	21164	22109	23340	24957	27120	34395	52425
55	19657	19877	20162	20577	21145	21896	22874	24147	25819	28056	35581	54232
56	20326	20553	20847	21277	21864	22640	23651	24968	26696	29009	36788	56069
57	21006	21241	21544	21988	22595	23396	24441	25801	27587	29977	38015	57937
58	21696	21939	22252	22711	23337	24165	25244	26649	28493	30961	39262	59835
59	22398	22649	22972	23445	24092	24946	26060	27510	29414	31961	40529	61763
60	23111	23370	23703	24192	24859	25740	26889	28385	30349	32976	41816	63723

ROADBED 16 FEET. SIDE SLOPE 1¼ TO 1.

CENTER HEIGHT	0°= 0.0%	4°= 7.0%	6°= 10.5%	8°= 14.1%	10°= 17.9%	12°= 21.3%	14°= 24.9%	16°= 28.7%	18°= 32.5%	20°= 36.4%	24°= 44.5%	28°= 53.2%
0		9	15	21	28	37	47	60	75	95	159	311
1	65	68	71	75	83	93	106	123	144	172	261	475
2	141	144	148	155	163	175	189	209	235	270	388	673
3	228	232	238	246	257	271	291	315	348	390	540	905
4	326	332	338	349	362	381	405	436	477	531	716	1172
5	435	442	450	462	480	502	532	570	620	687	913	1472
6	556	564	574	589	609	636	672	718	778	859	1130	1803
7	688	697	709	726	751	783	824	879	950	1046	1367	2164
8	830	841	855	875	904	941	990	1054	1137	1249	1625	2556
9	983	997	1012	1036	1069	1112	1168	1242	1339	1468	1902	2978
10	1148	1164	1181	1209	1246	1296	1360	1445	1555	1703	2200	3431
11	1324	1342	1362	1393	1436	1492	1565	1661	1786	1953	2517	3915
12	1511	1531	1554	1589	1636	1700	1783	1890	2031	2220	2855	4429
13	1709	1730	1757	1797	1849	1921	2013	2133	2291	2502	3213	4973
14	1919	1942	1971	2016	2075	2154	2256	2390	2565	2800	3590	5548
15	2139	2165	2197	2246	2312	2399	2512	2660	2854	3114	3988	6154
16	2370	2399	2435	2488	2560	2656	2782	2944	3158	3444	4406	6790
17	2613	2644	2684	2742	2821	2926	3064	3242	3476	3790	4844	7457
18	2867	2900	2944	3008	3094	3209	3359	3553	3809	4151	5302	8154
19	3131	3168	3215	3285	3379	3504	3666	3878	4156	4528	5780	8882
20	3407	3447	3498	3573	3676	3811	3987	4217	4518	4921	6278	9640
21	3694	3737	3793	3874	3984	4130	4321	4569	4895	5330	6796	10429
22	3993	4039	4098	4186	4305	4462	4668	4935	5286	5755	7334	11248
23	4302	4351	4416	4509	4637	4807	5027	5314	5691	6196	7892	12098
24	4623	4675	4744	4845	4982	5163	5400	5707	6111	6652	8471	12978
25	4954	5011	5084	5192	5338	5532	5785	6114	6546	7124	9069	13889
26	5296	5357	5435	5550	5707	5914	6183	6534	6996	7612	9687	14831
27	5650	5715	5798	5920	6087	6307	6595	6968	7459	8116	10326	15803
28	6015	6083	6172	6302	6479	6713	7019	7416	7938	8636	10984	16805
29	6391	6464	6558	6695	6884	7132	7456	7877	8431	9171	11663	17838
30	6778	6855	6954	7100	7300	7563	7906	8352	8939	9723	12362	18902
31	7176	7257	7363	7517	7728	8006	8369	8841	9461	10290	13080	19996
32	7585	7671	7782	7945	8168	8461	8844	9343	9998	10873	13819	21121
33	8006	8096	8214	8385	8620	8929	9333	9859	10549	11472	14578	22276
34	8437	8533	8656	8837	9084	9410	9835	10388	11115	12087	15357	23462
35	8880	8980	9110	9300	9560	9902	10349	10931	11695	12717	16156	24678
36	9333	9439	9575	9775	10048	10407	10877	11488	12290	13364	16975	25925
37	9798	9909	10052	10261	10548	10925	11417	12058	12900	14026	17814	27202
38	10274	10390	10540	10759	11059	11455	11971	12642	13524	14704	18673	28510
39	10761	10883	11040	11269	11583	11997	12537	13240	14163	15398	19552	29848
40	11259	11386	11551	11790	12118	12551	13116	13851	14816	16108	20451	31217
41	11769	11901	12073	12323	12666	13118	13708	14476	15484	16834	21370	32617
42	12289	12427	12606	12868	13225	13697	14313	15114	16167	17575	22310	34047
43	12820	12965	13151	13424	13797	14289	14931	15766	16864	18332	23269	35507
44	13363	13514	13708	13992	14380	14893	15562	16432	17575	19105	24249	36998
45	13917	14073	14276	14572	14975	15509	16205	17112	18302	19894	25248	38520
46	14481	14645	14855	15163	15583	16138	16862	17805	19042	20698	26268	40072
47	15057	15227	15445	15766	16202	16779	17532	18511	19798	21519	27307	41655
48	15644	15820	16047	16380	16833	17433	18214	19232	20568	22355	28367	43268
49	16243	16425	16661	17006	17476	18098	18910	19965	21352	23207	29447	44912
50	16852	17041	17286	17644	18131	18777	19618	20713	22151	24075	30546	46586
51	17472	17669	17922	18293	18799	19467	20339	21474	22965	24959	31666	48291
52	18104	18307	18569	18954	19478	20170	21073	22249	23793	25858	32806	50026
53	18746	18957	19228	19626	20169	20885	21821	23038	24636	26774	33966	51792
54	19400	19618	19899	20310	20872	21613	22581	23840	25493	27705	35146	53589
55	20065	20290	20580	21006	21586	22353	23353	24655	26365	28652	36346	55416
56	20741	20974	21274	21713	22313	23105	24139	25485	27252	29615	37566	57273
57	21428	21668	21978	22432	23052	23870	24938	26328	28153	30594	38806	59161
58	22126	22374	22694	23163	23803	24647	25750	27184	29068	31588	40067	61080
59	22835	23091	23421	23905	24565	25437	26574	28055	29999	32599	41347	63029
60	23556	23820	24160	24659	25339	26239	27412	28939	30943	33625	42647	65009

ROADBED 18 FEET. SIDE SLOPE 1½ TO 1.

CENTER HEIGHT.	0°= 0.0%	4°= 7.0%	6°= 10.5%	8°= 14.1%	10°= 17.6%	12°= 21.3%	14°= 24.9%	16°= 28.7%	18°= 32.5%	20°= 36.4%	24°= 44.5%	28°= 53.2%
0		12	18	26	36	47	60	75	95	120	201	390
1	72	75	79	86	96	109	125	145	171	205	314	573
2	156	160	165	172	182	196	214	238	270	312	452	786
3	250	255	261	271	284	301	323	352	390	441	615	1031
4	356	362	370	381	397	418	446	482	529	591	803	1316
5	472	480	489	503	523	548	582	625	682	758	1013	1647
6	600	609	620	637	660	691	730	782	849	940	1244	1998
7	739	749	763	783	810	845	892	952	1031	1138	1495	2380
8	889	901	917	940	971	1012	1066	1136	1228	1351	1766	2792
9	1050	1064	1082	1108	1144	1191	1253	1334	1439	1581	2056	3235
10	1222	1238	1258	1288	1329	1383	1454	1545	1665	1826	2367	3708
11	1406	1423	1446	1480	1526	1587	1667	1770	1906	2087	2698	4212
12	1600	1620	1646	1684	1735	1804	1893	2009	2161	2364	3049	4747
13	1806	1828	1857	1899	1956	2033	2132	2261	2430	2657	3420	5311
14	2022	2047	2079	2126	2189	2274	2384	2527	2715	2966	3811	5907
15	2250	2277	2312	2364	2434	2527	2648	2806	3013	3290	4222	6533
16	2489	2519	2557	2614	2691	2793	2926	3099	3327	3631	4654	7189
17	2739	2772	2814	2876	2960	3071	3217	3406	3654	3987	5105	7876
18	3000	3036	3082	3149	3241	3362	3520	3726	3997	4359	5576	8593
19	3272	3311	3361	3434	3533	3665	3837	4060	4354	4747	6068	9342
20	3556	3597	3651	3730	3838	3981	4166	4408	4726	5150	6579	10121
21	3850	3895	3953	4038	4155	4308	4509	4769	5112	5570	7111	10930
22	4156	4204	4267	4358	4483	4648	4864	5144	5513	6005	7662	11769
23	4472	4524	4591	4690	4824	5001	5232	5533	5928	6456	8234	12640
24	4800	4856	4927	5033	5176	5366	5613	5935	6358	6923	8826	13540
25	5139	5198	5275	5387	5540	5743	6007	6351	6802	7406	9437	14472
26	5489	5552	5634	5753	5917	6133	6414	6780	7261	7905	10069	15433
27	5850	5917	6004	6131	6305	6535	6834	7223	7735	8419	10721	16426
28	6222	6294	6386	6521	6705	6949	7267	7680	8223	8949	11393	17449
29	6606	6681	6779	6922	7117	7376	7712	8150	8726	9495	12085	18502
30	7000	7080	7184	7335	7542	7815	8171	8634	9243	10057	12797	19586
31	7406	7490	7599	7759	7978	8266	8642	9132	9775	10635	13529	20701
32	7822	7911	8027	8195	8426	8730	9127	9643	10321	11229	14281	21846
33	8250	8344	8465	8643	8886	9206	9624	10168	10883	11838	15053	23021
34	8689	8788	8915	9102	9357	9695	10134	10707	11458	12463	15845	24227
35	9139	9243	9377	9573	9841	10196	10658	11259	12048	13105	16658	25464
36	9600	9709	9850	10056	10337	10709	11194	11825	12653	13761	17490	26731
37	10072	10187	10334	10550	10845	11235	11743	12404	13272	14434	18342	28029
38	10556	10676	10830	11056	11365	11773	12305	12997	13906	15123	19215	29357
39	11050	11175	11337	11573	11896	12323	12879	13604	14555	15827	20107	30716
40	11556	11686	11855	12102	12440	12886	13467	14224	15218	16547	21020	32105
41	12072	12209	12385	12643	12995	13461	14068	14858	15896	17283	21953	33525
42	12600	12743	12926	13195	13563	14048	14681	15506	16588	18035	22905	34975
43	13139	13287	13479	13759	14142	14648	15308	16167	17295	18803	23878	36456
44	13689	13843	14043	14335	14734	15261	15947	16842	18016	19587	24871	37968
45	14250	14411	14618	14922	15337	15885	16600	17530	18752	20386	25884	39510
46	14822	14989	15205	15521	15952	16522	17265	18232	19507	21201	26917	41082
47	15406	15579	15803	16131	16579	17171	17943	18948	20267	22032	27970	42685
48	16000	16180	16413	16753	17219	17833	18634	19677	21047	22879	29043	44319
49	16606	16792	17034	17387	17870	18507	19338	20420	21841	23742	30136	45983
50	17222	17416	17666	18032	18533	19194	20055	21177	22650	24620	31249	47678
51	17850	18051	18310	18689	19208	19893	20785	21947	23473	25515	32382	48403
52	18489	18697	18965	19358	19895	20604	21528	22731	24311	26425	33535	50158
53	19139	19354	19632	20038	20593	21327	22284	23529	25164	27351	34709	51945
54	19800	20022	20310	20730	21304	22063	23052	24340	26031	28293	35902	53761
55	20472	20702	20999	21434	22027	22811	23834	25165	26913	29250	37115	55609
56	21156	21393	21700	22149	22762	23572	24628	26003	27809	30224	38349	57487
57	21850	22095	22412	22876	23509	24345	25436	26855	28720	31213	39602	59395
58	22556	22809	23136	23614	24267	25131	26256	27721	29645	32218	40876	61334
59	23272	23533	23870	24363	25038	25928	27089	28600	30585	33239	42170	63303
60	24000	24269	24617	25125	25820	26738	27935	29193	31539	34276	43483	65303

ROADBED 20 FEET. SIDE SLOPE 1½ TO 1.

CENTER HEIGHT.	0°= 0.0%	4°= 7.0%	6°= 10.5%	8°= 14.1%	10°= 17.6%	12°= 21.3%	14°= 24.9%	16°= 28.7%	18°= 32.5%	20°= 36.4%	24°= 44.5%	28°= 53.2%
0		15	23	33	44	58	74	93	117	148	248	486
1	80	83	88	97	109	124	145	170	201	241	372	687
2	170	175	181	190	202	218	240	268	306	356	521	921
3	272	278	285	296	311	331	357	390	434	494	695	1190
4	385	392	401	415	433	457	488	529	582	654	895	1494
5	509	518	529	545	566	595	632	681	745	830	1118	1831
6	644	654	667	686	712	745	789	847	922	1023	1362	2203
7	791	802	817	839	869	908	959	1026	1114	1231	1626	2605
8	948	961	979	1004	1038	1083	1143	1219	1320	1456	1910	3037
9	1116	1132	1151	1180	1219	1271	1338	1426	1541	1696	2215	3500
10	1296	1313	1336	1368	1412	1470	1547	1647	1777	1952	2539	3994
11	1487	1506	1531	1568	1617	1683	1769	1881	2027	2223	2883	4518
12	1689	1710	1738	1779	1835	1908	2004	2128	2292	2511	3247	5073
13	1902	1926	1957	2002	2064	2145	2251	2390	2571	2814	3632	5658
14	2126	2152	2186	2236	2304	2394	2512	2665	2865	3134	4036	6274
15	2361	2390	2428	2482	2557	2656	2785	2953	3174	3469	4461	6920
16	2607	2639	2680	2740	2822	2930	3072	3255	3497	3819	4905	7597
17	2865	2899	2944	3010	3099	3217	3371	3571	3834	4186	5370	8304
18	3133	3171	3219	3291	3388	3516	5683	3901	4186	4569	5855	9042
19	3413	3454	3506	3583	3688	3827	4008	4244	4553	4967	6360	9811
20	3704	3748	3804	3887	4001	4151	4346	4600	4934	5381	6884	10610
21	4005	4053	4114	4203	4325	4487	4697	4971	5330	5811	7429	11439
22	4318	4369	4435	4531	4662	4835	5061	5355	5741	6257	7994	12299
23	4642	4697	4767	4870	5010	5196	5438	5752	6166	6719	8579	13190
24	4978	5036	5111	5221	5371	5569	5827	6164	6605	7196	9184	14111
25	5324	5386	5466	5583	5743	5954	6230	6589	7060	7690	9809	15063
26	5681	5747	5833	5957	6127	6352	6646	7027	7528	8199	10454	16045
27	6050	6120	6211	6343	6524	6763	7074	7479	8012	8724	11121	17057
28	6430	6504	6600	6740	6932	7185	7515	7945	8510	9265	11805	18101
29	6820	6899	7001	7149	7352	7620	7970	8425	9022	9821	12510	19175
30	7222	7305	7413	7570	7784	8067	8437	8918	9549	10394	13236	20279
31	7635	7723	7836	8002	8228	8527	8917	9424	10091	10982	13981	21414
32	8059	8152	8271	8446	8684	8999	9410	9945	10647	11586	14747	22579
33	8494	8592	8717	8901	9152	9484	9916	10479	11218	12206	15532	23775
34	8941	9043	9175	9368	9632	9980	10435	11026	11803	12842	16338	25001
35	9398	9505	9644	9847	10124	10490	10967	11588	12403	13494	17163	26258
36	9867	9978	10124	10337	10627	11011	11511	12162	13017	14161	18009	27546
37	10346	10464	10616	10839	11143	11545	12069	12751	13647	14844	18875	28864
38	10837	10960	11120	11353	11671	12091	12639	13353	14290	15544	19761	30213
39	11339	11468	11634	11878	12210	12650	13223	13969	14948	16259	20667	31592
40	11852	11986	12160	12415	12762	13221	13819	14598	15621	16989	21593	33001
41	12376	12516	12698	12963	13325	13804	14429	15241	16308	17736	22539	34442
42	12911	13057	13247	13523	13901	14400	15051	15898	17010	18499	23505	35912
43	13457	13610	13807	14095	14488	15008	15686	16568	17727	19277	24491	37414
44	14015	14173	14378	14678	15088	15629	16334	17252	18458	20071	25497	38945
45	14583	14748	14961	15273	15699	16262	16995	17950	19204	20881	26523	40508
46	15163	15334	15556	15880	16322	16907	17669	18661	19964	21707	27569	42101
47	15754	15932	16162	16498	16957	17564	18356	19386	20739	22548	28636	43724
48	16356	16540	16779	17128	17604	18234	19055	20124	21528	23406	29722	45378
49	16968	17160	17407	17769	18263	18917	19768	20876	22332	24279	30829	47062
50	17592	17791	18047	18422	18934	19611	20494	21642	23150	25168	31955	48777
51	18228	18433	18699	19087	19617	20318	21232	22421	23983	26073	33102	50523
52	18874	19087	19362	19763	20312	21038	21983	23214	24831	26994	34268	52299
53	19531	19752	20036	20451	21019	21770	22748	24021	25693	27930	35455	54106
54	20200	20427	20721	21151	21738	22513	23525	24841	26570	28883	36662	55943
55	20880	21115	21418	21862	22469	23270	24315	25675	27461	29851	37889	57810
56	21570	21813	22126	22585	23211	24039	25118	26523	28367	30835	39135	59709
57	22272	22523	22846	23320	23966	24820	25934	27384	29288	31835	40402	61637
58	22985	23244	23577	24066	24733	25614	26763	28259	30223	32850	41689	63597
59	23709	23976	24320	24823	25511	26420	27605	29147	31173	33882	42996	65586
60	24444	24719	25074	25593	26302	27239	28460	30049	32137	34929	43323	67607

ROADBED 27 FEET. SIDE SLOPE 1¼ TO 1.

CENTER HEIGHT.	0° = 0.0%	4° = 7.0%	6° = 10.5%	8° = 14.1%	10° = 17.6%	12° = 21.3%	14° = 24.9%	16° = 28.7%	18° = 32.5%	20° = 36.4%	24° = 44.5%	28° = 53.2%
0		26	42	60	81	105	134	170	214	271	452	887
1	105	112	122	140	163	192	226	269	323	392	616	1151
2	222	230	239	253	274	303	342	391	454	536	804	1450
3	350	359	370	387	410	441	481	535	607	702	1017	1783
4	489	499	513	533	559	595	642	702	782	890	1255	2151
5	639	651	667	690	721	762	816	886	978	1101	1518	2553
6	800	814	832	858	894	941	1003	1084	1189	1331	1807	2990
7	972	988	1008	1038	1079	1133	1204	1295	1415	1576	2117	3460
8	1155	1173	1196	1230	1276	1337	1417	1520	1656	1837	2448	3962
9	1350	1370	1396	1434	1485	1554	1643	1759	1911	2114	2799	4497
10	1556	1578	1607	1649	1706	1783	1882	2011	2180	2407	3170	5061
11	1772	1797	1829	1876	1939	2024	2134	2277	2465	2716	3561	5657
12	2000	2027	2062	2114	2184	2277	2398	2556	2763	3040	3972	6283
13	2239	2269	2307	2364	2441	2543	2676	2849	3077	3381	4404	6939
14	2489	2522	2564	2626	2710	2821	2967	3156	3404	3737	4855	7626
15	2750	2786	2831	2899	2991	3112	3270	3476	3747	4109	5326	8344
16	3022	3061	3111	3184	3283	3415	3587	3810	4104	4497	5818	9092
17	3306	3347	3401	3480	3588	3731	3916	4158	4476	4900	6329	9871
18	3600	3645	3703	3788	3905	4058	4259	4519	4862	5320	6860	10680
19	3906	3954	4016	4108	4233	4398	4614	4894	5263	5755	7412	11519
20	4222	4274	4341	4440	4574	4751	4982	5283	5678	6206	7984	12390
21	4550	4606	4677	4783	4926	5116	5363	5685	6108	6673	8575	13290
22	4889	4948	5025	5137	5290	5493	5757	6101	6552	7156	9187	14222
23	5239	5302	5384	5503	5666	5883	6164	6530	7011	7654	9819	15184
24	5600	5667	5754	5881	6055	6285	6584	6973	7485	8169	10471	16176
25	5972	6044	6136	6271	6455	6699	7017	7430	7973	8699	11142	17199
26	6356	6431	6529	6672	6867	7126	7462	7900	8476	9245	11834	18252
27	6750	6830	6933	7085	7291	7565	7921	8384	8993	9807	12546	19336
28	7156	7240	7349	7509	7728	8016	8393	8882	9525	10385	13278	20451
29	7572	7661	7777	7945	8176	8480	8877	9393	10072	10979	14031	21596
30	8000	8094	8215	8393	8635	8956	9374	9918	10633	11588	14803	22771
31	8438	8538	8665	8852	9107	9445	9885	10457	11208	12213	15595	23977
32	8889	8993	9127	9323	9591	9946	10408	11009	11799	12854	16407	25214
33	9350	9459	9600	9806	10087	10459	10944	11575	12403	13511	17240	26481
34	9822	9936	10084	10300	10595	10985	11493	12154	13023	14184	18092	27779
35	10305	10425	10579	10806	11114	11523	12055	12747	13657	14873	18964	29107
36	10800	10925	11086	11323	11646	12073	12630	13354	14305	15577	19857	30466
37	11305	11436	11605	11852	12190	12636	13217	13974	14968	16297	20769	31855
38	11822	11959	12135	12393	12745	13211	13818	14608	15646	17033	21702	33275
39	12350	12492	12676	12945	13312	13799	14432	15256	16338	17785	22655	34726
40	12888	13037	13229	13509	13892	14398	15058	15917	17045	18553	23627	36206
41	13438	13593	13793	14085	14483	15011	15698	16592	17766	19336	24620	37717
42	14000	14160	14368	14672	15086	15635	16350	17281	18501	20137	25633	39259
43	14572	14739	14955	15271	15702	16272	17015	17982	19253	20951	26666	40832
44	15155	15329	15553	15881	16329	16922	17694	18798	20018	21782	27719	42436
45	15750	15930	16163	16503	16968	17583	18385	19427	20797	22629	28792	44069
46	16355	16542	16784	17137	17619	18257	19089	20170	21592	23491	29885	45733
47	16972	17166	17416	17783	18282	18944	19806	20927	22400	24370	30998	47428
48	17600	17801	18060	18440	18957	19643	20536	21697	23224	25264	32131	49153
49	18238	18447	18715	19108	19644	20354	21278	22481	24062	26174	33284	50909
50	18888	19104	19381	19788	20343	21078	22034	23279	24914	27100	34458	52695
51	19550	19772	20059	20480	21054	21813	22803	24090	25781	28042	35651	54512
52	20222	20452	20749	21183	21777	22562	23584	24915	26663	29000	36864	56359
53	20905	21143	21449	21899	22512	23322	24379	25753	27559	29973	38098	58237
54	21600	21845	22162	22626	23258	24095	25186	26605	28470	30963	39351	60145
55	22305	22559	22885	23364	24017	24881	26007	27471	29396	31968	40625	62084
56	23022	23283	23620	24114	24787	25679	26840	28350	30335	32989	41919	64054
57	23750	24019	24366	24876	25570	26489	27686	29243	31290	34026	43232	66054
58	24488	24766	25124	25649	26364	27311	28545	30150	32259	35078	44566	68084
59	25238	25525	25893	26434	27171	28146	29417	31070	33243	36147	45920	70145
60	26000	26294	26674	27230	27989	28993	30302	32004	34241	37231	47294	72237

ROADBED 29 FEET. SIDE SLOPE 1½ to 1.

CENTER HEIGHT.	0°= 0.0%	4°= 7.0%	6°= 10.5%	8°= 14.1%	10°= 17.6%	12°= 21.3%	14°= 24.9%	16°= 28.7%	18°= 32.5%	20°= 36.4%	24°= 44.5%	28°= 53.2%
0		29	49	70	94	122	155	196	247	312	523	1022
1	113	119	134	154	181	213	253	302	363	442	697	1305
2	237	246	257	272	296	330	374	429	501	593	895	1622
3	373	382	395	414	440	473	519	580	661	768	1120	1973
4	519	530	545	567	597	636	688	754	844	964	1369	2358
5	676	690	707	732	766	811	871	948	1049	1183	1644	2779
6	845	860	880	908	947	999	1067	1155	1270	1424	1943	3233
7	1025	1042	1064	1096	1141	1199	1276	1375	1506	1680	2267	3825
8	1215	1235	1259	1296	1346	1412	1497	1609	1756	1952	2612	4248
9	1417	1439	1467	1507	1563	1636	1732	1857	2021	2239	2976	4802
10	1630	1654	1685	1730	1792	1873	1980	2118	2300	2543	3361	5388
11	1854	1881	1915	1965	2033	2123	2240	2393	2594	2862	3765	6004
12	2091	2119	2156	2211	2286	2385	2514	2682	2902	3197	4190	6650
13	2336	2368	2409	2469	2551	2659	2800	2984	3225	3548	4634	7327
14	2593	2628	2673	2738	2827	2946	3100	3300	3563	3915	5099	8034
15	2862	2899	2948	3019	3116	3245	3412	3629	3915	4298	5584	8772
16	3142	3182	3235	3312	3417	3556	3737	3973	4282	4696	6089	9541
17	3432	3476	3533	3616	3729	3880	4075	4329	4663	5110	6614	10340
18	3734	3781	3843	3932	4054	4216	4426	4700	5059	5540	7158	11170
19	4047	4098	4163	4260	4391	4564	4790	5084	5470	5986	7723	12030
20	4371	4426	4496	4599	4739	4925	5167	5481	5895	6448	8309	12921
21	4707	4765	4840	4950	5099	5298	5556	5893	6335	6925	8914	13842
22	5053	5115	5195	5312	5472	5683	5959	6318	6789	7419	9539	14794
23	5410	5476	5561	5686	5856	6081	6375	6756	7258	7928	10184	15776
24	5779	5849	5939	6072	6252	6492	6803	7208	7741	8453	10849	16789
25	6159	6233	6329	6469	6661	6914	7245	7674	8239	8994	11535	17832
26	6549	6628	6729	6878	7081	7349	7699	8154	8752	9551	12240	18906
27	6951	7034	7141	7299	7513	7797	8166	8647	9279	10123	12965	20010
28	7364	7452	7565	7731	7957	8256	8646	9154	9820	10711	13711	21145
29	7788	7881	8000	8175	8413	8729	9139	9674	10377	11316	14476	22311
30	8224	8321	8446	8630	8881	9213	9645	10208	10948	11936	15262	23507
31	8670	8772	8904	9097	9361	9710	10164	10756	11533	12572	16068	24733
32	9127	9235	9373	9576	9853	10219	10696	11317	12133	13223	16893	25990
33	9596	9708	9853	10066	10356	10741	11241	11892	12747	13891	17739	27278
34	10076	10193	10345	10568	10872	11275	11799	12480	13377	14574	18605	28596
35	10566	10690	10849	11082	11400	11821	12369	13083	14020	15273	19491	29945
36	11068	11197	11363	11607	11939	12380	12953	13698	14679	15988	20397	31324
37	11581	11716	11889	12144	12491	12951	13549	14328	15351	16719	21323	32734
38	12105	12246	12427	12692	13055	13534	14159	14971	16039	17466	22269	34174
39	12641	12787	12976	13253	13630	14130	14781	15628	16741	18228	23235	35645
40	13187	13339	13536	13824	14217	14738	15416	16298	17457	19007	24221	37147
41	13744	13903	14108	14408	14817	15359	16064	16982	18188	19801	25227	38678
42	14313	14478	14691	15003	15428	15991	16725	17680	18934	20611	26254	40241
43	14893	15064	15285	15609	16051	16637	17399	18391	19694	21437	27300	41834
44	15483	15661	15891	16228	16687	17294	18086	19116	20469	22278	28366	43457
45	16085	16270	16508	16857	17334	17964	18786	19854	21259	23136	29453	45111
46	16698	16890	17137	17499	17993	18647	19498	20606	22063	24009	30559	46796
47	17322	17521	17777	18152	18664	19341	20224	21372	22881	24898	31686	48511
48	17958	18163	18428	18817	19347	20048	20963	22152	23714	25803	32832	50257
49	18604	18817	19091	19493	20042	20768	21714	22945	24562	26724	33999	52033
50	19261	19481	19765	20181	20749	21500	22478	23751	25424	27660	35186	53840
51	19930	20157	20451	20881	21468	22244	23256	24572	26301	28613	36393	55677
52	20609	20844	21148	21592	22198	23001	24046	25406	27193	29581	37619	57545
53	21300	21543	21856	22315	22941	23770	24849	26253	28099	30565	38866	59443
54	22002	22253	22576	23050	23696	24551	25665	27114	29019	31565	40133	61372
55	22715	22974	23307	23796	24462	25345	26494	27989	29954	32581	41420	63331
56	23439	23706	24050	24554	25241	26151	27336	28878	30904	33612	42727	65321
57	24174	24449	24804	25323	26031	26969	28191	29780	31868	34660	44054	67342
58	24921	25204	25569	26104	26834	27800	29058	30696	32847	35723	45402	69393
59	25678	25970	26346	26897	27648	28643	29939	31625	33841	36805	46769	71474
60	26447	26747	27134	27701	28475	29499	30833	32568	34849	37897	48156	73586

ROADBED 31 FEET. SIDE SLOPE 1½ to 1.

CENTER HEIGHT.	0°= 0.0%	4°= 7.0%	6°= 10.5%	8°= 14.1%	10°= 17.6%	12°= 21.3%	14°= 24.9%	16°= 28.7%	18°= 32.5%	20°= 36.4%	24°= 44.5%	28°= 53.2%
0		34	55	79	107	139	177	224	282	356	596	1169
1	120	127	144	169	199	236	281	336	405	494	781	1469
2	252	261	273	291	320	358	408	470	550	654	992	1805
3	394	405	419	440	467	507	559	628	718	836	1227	2175
4	548	561	577	601	634	677	733	808	908	1041	1488	2579
5	713	727	746	773	811	860	925	1009	1120	1269	1773	3017
6	888	905	926	957	1000	1056	1129	1225	1350	1518	2084	3490
7	1075	1094	1118	1153	1201	1264	1347	1454	1595	1784	2419	3998
8	1274	1294	1321	1360	1414	1485	1577	1697	1855	2066	2776	4539
9	1483	1506	1536	1579	1639	1718	1820	1954	2130	2364	3154	5112
10	1703	1729	1762	1810	1876	1963	2077	2224	2419	2678	3552	5717
11	1935	1963	1999	2052	2125	2221	2346	2508	2722	3008	3969	6354
12	2177	2208	2248	2306	2385	2491	2628	2806	3040	3353	4407	7020
13	2431	2464	2508	2571	2658	2773	2923	3117	3373	3715	4865	7717
14	2696	2732	2779	2849	2943	3068	3230	3442	3720	4092	5343	8444
15	2971	3011	3062	3137	3240	3375	3551	3781	4082	4485	5841	9203
16	3258	3301	3357	3438	3548	3694	3885	4133	4458	4894	6359	9991
17	3557	3603	3662	3750	3869	4026	4231	4499	4849	5319	6897	10810
18	3866	3915	3979	4073	4201	4370	4591	4878	5255	5759	7455	11660
19	4186	4239	4308	4408	4546	4727	4963	5271	5675	6215	8034	12541
20	4518	4574	4648	4755	4902	5096	5349	5678	6110	6688	8632	13451
21	4860	4921	4999	5114	5270	5477	5747	6098	6559	7176	9250	14393
22	5214	5278	5362	5484	5650	5871	6158	6532	7023	7679	9889	15365
23	5579	5647	5736	5866	6043	6277	6582	6980	7501	8199	10547	16367
24	5954	6028	6121	6259	6447	6695	7019	7441	7994	8735	11226	17400
25	6341	6419	6518	6664	6863	7126	7469	7916	8502	9286	11924	18464
26	6740	6821	6926	7081	7291	7569	7932	8404	9024	9853	12643	19558
27	7149	7235	7346	7509	7731	8025	8408	8906	9561	10436	13381	20682
28	7569	7660	7777	7949	8183	8493	8897	9422	10112	11035	14140	21837
29	8001	8096	8220	8400	8647	8973	9398	9951	10678	11650	14919	23024
30	8443	8544	8673	8863	9123	9466	9913	10494	11259	12280	15718	24239
31	8897	9002	9139	9338	9610	9971	10440	11051	11854	12926	16537	25486
32	9362	9472	9615	9825	10110	10488	10981	11621	12463	13588	17376	26763
33	9837	9953	10103	10323	10622	11018	11534	12205	13087	14266	18235	28071
34	10324	10446	10603	10831	11145	11560	12100	12803	13726	14960	19114	29409
35	10823	10950	11114	11353	11681	12115	12679	13414	14379	15670	20013	30778
36	11332	11464	11636	11886	12228	12681	13271	14039	15047	16395	20932	32178
37	11852	11991	12169	12431	12788	13261	13876	14677	15730	17137	21871	33607
38	12384	12528	12714	12987	13359	13852	14494	15329	16427	17894	22831	35068
39	12926	13076	13171	13555	13943	14456	15125	15995	17138	18667	23810	36559
40	13480	13636	13838	14134	14538	15072	15769	16674	17864	19455	24809	38080
41	14045	14207	14418	14724	15145	15701	16425	17367	18605	20260	25829	39632
42	14620	14790	15008	15327	15764	16342	17095	18074	19361	21080	26868	41215
43	15207	15383	15610	15942	16396	16996	17777	18794	20130	21917	27928	42828
44	15806	15988	16224	16568	17039	17661	18473	19528	20915	22769	29007	44472
45	16415	16604	16848	17206	17694	18340	19181	20275	21714	23637	30107	46146
46	17035	17231	17484	17855	18361	19030	19902	21037	22528	24520	31227	47851
47	17667	17868	18132	18516	19040	19733	20636	21811	23356	25420	32367	49586
48	18309	18518	18791	19188	19730	20448	21383	22600	24198	26335	33526	51352
49	18963	19180	19461	19872	20433	21176	22143	23402	25056	27266	34706	53148
50	19628	19852	20143	20568	21148	21916	22916	24218	25928	28214	35906	54975
51	20303	20536	20836	21275	21875	22668	23702	25047	26814	29176	37126	56832
52	20990	21231	21541	21993	22613	23433	24501	25890	27715	30155	38366	58720
53	21689	21936	22257	22725	23364	24210	25312	26746	28631	31150	39627	60639
54	22398	22653	22984	23467	24127	25000	26137	27617	29561	32160	40907	62588
55	23118	23382	23723	24221	24901	25802	26975	28500	30506	33186	42207	64567
56	23850	24121	24473	24986	25687	26616	27825	29398	31465	34228	43527	66578
57	24592	24872	25234	25763	26486	27442	28688	30309	32439	35286	44868	68618
58	25346	25634	26007	26552	27296	28281	29564	31234	33428	36360	46228	70689
59	26111	26408	26791	27352	28119	29133	30454	32172	34431	37449	47609	72791
60	26886	27192	27587	28164	28953	29996	31356	33124	35448	38555	49009	74923

ROADBED 33 FEET. SIDE SLOPE 1½ to 1.

CENTER HEIGHT.	0°= 0.0%	4°= 7.0%	6°= 10.5%	8°= 14.1%	10°= 17.6%	12°= 21.3%	14°= 24.9%	16°= 28.7%	18°= 32.5%	20°= 36.4%	24°= 44.5%	28°= 53.2%
0		39	63	90	121	157	201	254	320	404	676	1368
1	128	136	156	184	218	261	310	372	450	550	872	1694
2	267	277	291	311	344	388	444	513	603	708	1094	2056
3	417	429	444	467	499	542	601	677	778	909	1344	2454
4	578	592	610	636	672	719	781	864	975	1122	1602	2887
5	750	766	786	816	857	911	981	1073	1194	1357	1909	3354
6	933	951	974	1008	1054	1115	1194	1298	1434	1615	2231	3857
7	1128	1148	1174	1211	1263	1331	1421	1536	1689	1892	2578	4396
8	1333	1356	1384	1427	1484	1560	1660	1789	1958	2185	2948	4968
9	1550	1575	1607	1652	1717	1802	1911	2054	2242	2494	3339	5577
10	1778	1805	1840	1892	1962	2055	2176	2334	2541	2818	3750	6218
11	2017	2047	2085	2142	2219	2321	2454	2627	2854	3158	4182	6889
12	2267	2299	2342	2403	2488	2599	2745	2934	3182	3515	4633	7592
13	2528	2563	2609	2677	2768	2890	3048	3254	3525	3887	5104	8327
14	2800	2839	2889	2961	3061	3193	3365	3588	3882	4274	5596	9092
15	3083	3125	3179	3258	3366	3508	3694	3936	4253	4678	6107	9889
16	3378	3423	3481	3566	3682	3836	4036	4297	4640	5097	6638	10717
17	3683	3732	3794	3886	4011	4176	4392	4672	5040	5533	7190	11576
18	4000	4052	4119	4217	4351	4529	4760	5061	5456	5984	7762	12467
19	4328	4383	4455	4560	4704	4894	5141	5463	5886	6451	8353	13388
20	4667	4726	4803	4915	5068	5271	5535	5879	6330	6934	8965	14342
21	5017	5080	5162	5281	5444	5661	5942	6308	6789	7432	9597	15326
22	5378	5445	5532	5659	5833	6062	6362	6751	7263	7947	10249	16341
23	5750	5821	5914	6049	6233	6477	6795	7208	7751	8477	10920	17388
24	6133	6209	6307	6450	6645	6904	7240	7678	8254	9023	11612	18466
25	6528	6608	6711	6863	7069	7343	7699	8162	8771	9585	12324	19575
26	6933	7018	7127	7287	7505	7794	8170	8660	9303	10163	13056	20715
27	7350	7439	7554	7723	7953	8258	8655	9171	9849	10757	13809	21887
28	7778	7872	7993	8171	8413	8734	9152	9696	10410	11366	14581	23090
29	8217	8316	8443	8630	8885	9223	9662	10234	10986	11991	15373	24325
30	8667	8771	8905	9101	9369	9724	10186	10787	11576	12632	16185	25590
31	9128	9237	9378	9584	9865	10237	10722	11352	12181	13289	17018	26887
32	9600	9714	9862	10078	10372	10763	11271	11932	12801	13962	17870	28215
33	10083	10203	10357	10584	10892	11301	11833	12525	13434	14651	18742	29574
34	10578	10703	10865	11101	11424	11851	12407	13131	14083	15355	19635	30964
35	11083	11214	11383	11630	11967	12414	12995	13752	14746	16075	20547	32386
36	11600	11736	11913	12171	12523	12989	13596	14386	15424	16811	21480	33839
37	12128	12270	12454	12723	13090	13576	14210	15033	16116	17563	22433	35323
38	12667	12815	13007	13287	13670	14176	14836	15695	16823	18331	23405	36838
39	13217	13371	13571	13863	14261	14789	15476	16369	17544	19114	24398	38385
40	13778	13938	14146	14450	14864	15413	16128	17058	18280	19914	25411	39963
41	14350	14517	14733	15049	15480	16050	16793	17760	19030	20729	26444	41572
42	14933	15107	15331	15659	16107	16699	17471	18476	19796	21560	27497	43212
43	15528	15708	15941	16281	16746	17361	18163	19205	20575	22407	28570	44884
44	16133	16320	16562	16915	17397	18035	18867	19948	21369	23269	29663	46587
45	16750	16944	17194	17560	18060	18722	19584	20705	22178	24148	30776	48321
46	17378	17579	17838	18217	18735	19421	20313	21475	23002	25042	31909	50086
47	18017	18225	18493	18886	19422	20132	21056	22259	23840	25952	33062	51883
48	18667	18882	19 60	19566	20121	20855	21812	23056	24692	26878	34236	53711
49	19328	19550	19838	20258	20832	21591	22581	23868	25559	27820	35429	55570
50	20000	20230	20527	20961	21554	22340	23362	24692	26441	28778	36642	57460
51	20683	20921	21228	21676	22289	23100	24157	25531	27337	29751	37876	59382
52	21378	21623	21940	22403	23036	23873	24964	26383	28248	30741	39129	61335
53	22083	22336	22663	23142	23794	24659	25784	27249	29173	31746	40403	63319
54	22800	23061	23398	23892	24565	25456	26618	28128	30113	32767	41697	65334
55	23528	23797	24145	24653	25347	26267	27464	29021	31068	33804	43010	67381
56	24267	24544	24902	25426	26142	27089	28323	29928	32037	34856	44344	69459
57	25017	25302	25671	26211	26948	27924	29195	30848	33021	35925	45698	71568
58	25778	26072	26452	27008	27767	28771	30080	31782	34019	37009	47072	73708
59	26550	26853	27244	27816	28597	29631	30977	32729	35032	38109	48466	75879
60	27333	27645	28047	28636	29439	30503	31888	33690	36059	39225	49880	78082

may be
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